PUBLIC WORKS

May 1951

CITY, COUNTY AND STATE

tandardizing State Highway Design

ile Trickling Filter Media For Heavy Loads

:ivil Air Patrol and Civil Defense

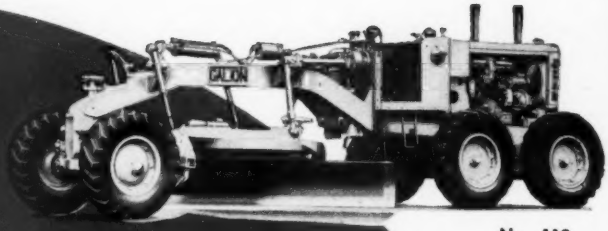
upplying Industrial Water to Tacoma

ly Control at a State Fair Grounds

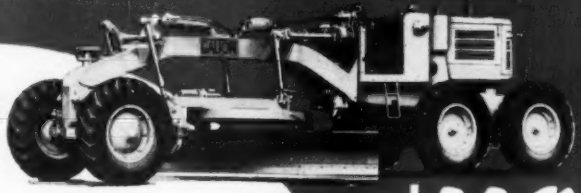
low Texas Controls Stream Pollution

James C. Harding, Commissioner of Public Works of Westchester County, New York, makes use of a helicopter for preliminary studies of parkway, highway and outfall sewer locations. More data on page 24.

MORE and MORE-

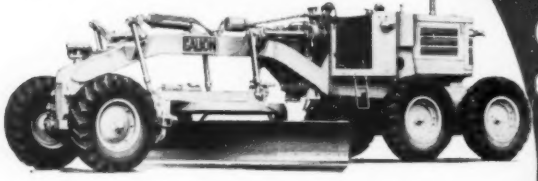


No. 118
MOTOR GRADER
Extra Heavy-Duty
100 h.p.
Diesel Engine

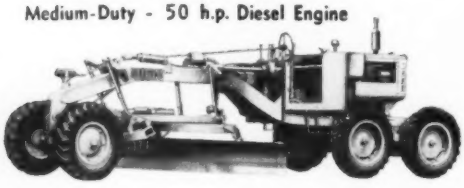


No. 104
MOTOR GRADER
Heavy-Duty
- 76 h.p.
Diesel Engine

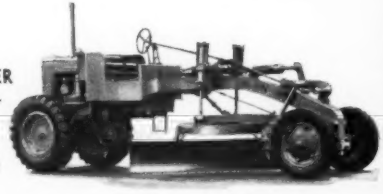
No. 203 MOTOR GRADER
Medium Heavy-Duty - 70 h.p. Diesel Engine



No. 303 MOTOR GRADER
Medium-Duty - 50 h.p. Diesel Engine



No. 402
MOTOR GRADER
Light-Duty -
31 h.p.
Gasoline
Engine



and MORE-

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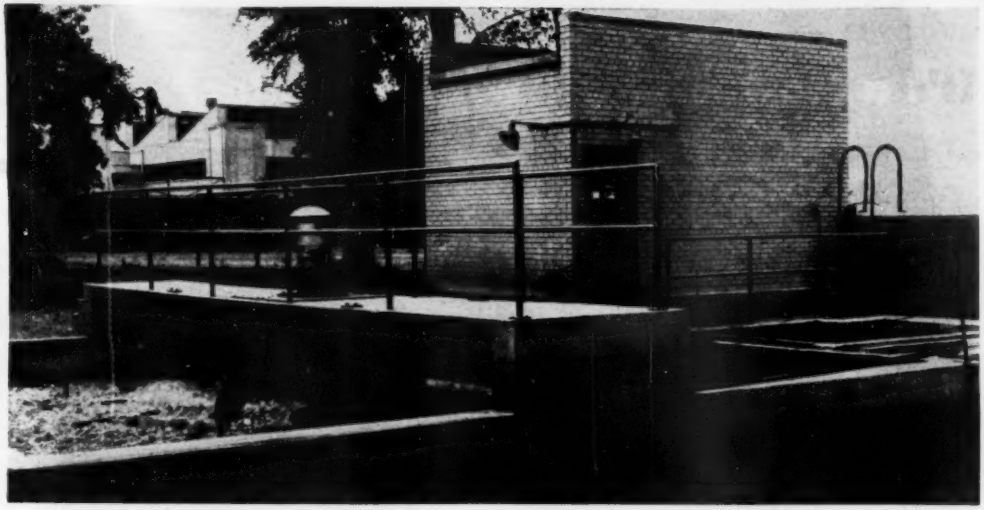

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"Pakage" Plants require a minimum of operating supervision, produce a sparkling clear effluent, are free from flies, foul odors, and unsightly appearance. Can be located near dwelling.

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Local Operators without previous sewage treatment experience successfully operate these plants. Former farmers, salesmen, coal-miners, truck-drivers are operating existing plants and performing other municipal duties.

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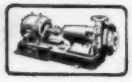
The "Pakage" plant was specifically developed for small populations and can be engineered to meet requirements. Complete literature available.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

2300 WOLFRAM STREET **CHICAGO 18, ILLINOIS**



Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.

Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

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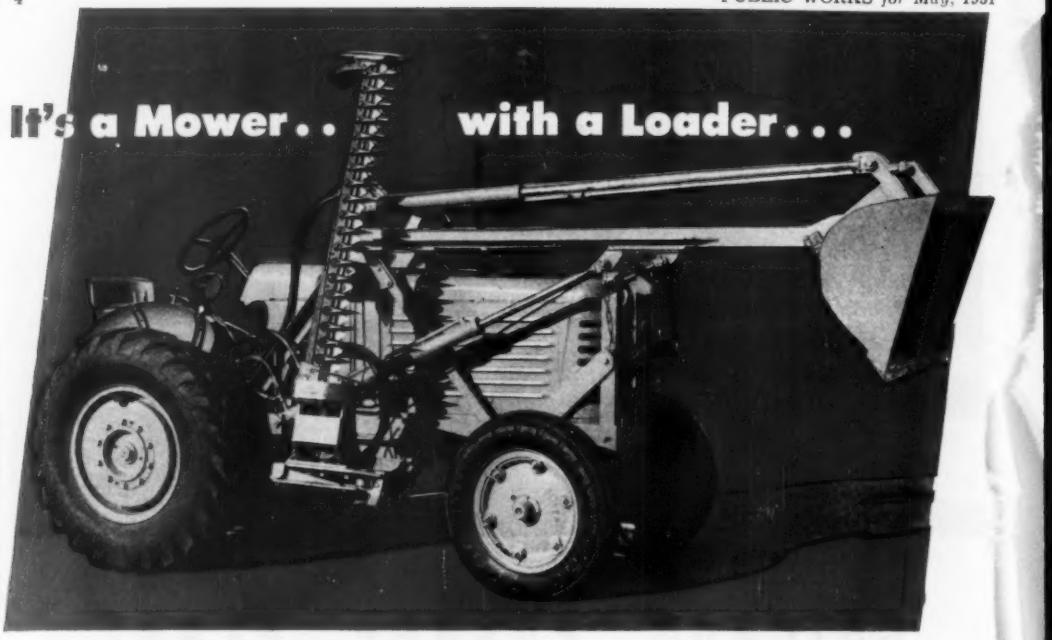

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Here's how to really step up the usefulness and profit-making ability of your Oliver Wheel Tractor-Loader. Simply add an Oliver Hydraulic Mower and you get a cost-cutting combination that will be busy virtually all year round. You can install the mower quickly and easily for those few days or weeks of work per mowing month . . . pull it off for the regular run of loading jobs. It's the ideal combination to cut your operating costs.

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Industrial Division: 19300 Euclid Avenue, Cleveland 17, Ohio

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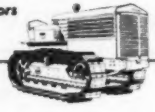

Now's the time to mail this month's Readers' Service card.

PUBLIC WORKS *Magazine*

Edited by W. A. Hardenbergh and A. Prescott Folwell

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THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

CRAFTSMANSHIP IN WATERWORKS BRASS

. . . results in uniform top quality. McDONALD Waterworks Brass is precision made from 85-5-5-5 metals with every step from foundry to final inspection and testing under rigid control. Shown above is E-4713-Stop, E-4753, E-4754 and E-4756- Copper Service Pipe Couplings.

An illustrated brochure with detailed specifications showing our complete line of Waterworks Brass will be sent to you promptly on request. A. Y. McDONALD MFG. CO., Dubuque, Iowa.

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THE EDITOR'S PAGE

Congratulations and Advice For Our Newest Engineers

THAT crop of young engineers about to be emitted by our various institutions of higher learning are to be congratulated. Aside from their wisdom in selecting the field of engineering, they are fortunate in graduating at a time when there are plenty of jobs and when a welcome mat is more likely than a closed door.

On the other hand it seems likely that draft boards are breathing down the necks of many of these young men. In our February issue, we published information on how to apply for service commissions; and there is another brief item on the same subject in this issue. Maybe we can be accused of being mighty free with other people's time when we say that a hitch in the army in a professional capacity will be a help and an advantage in the future, but we do feel that way. We hope these young men will be used in a professional capacity. The nation cannot afford to do otherwise.

We started this with the idea of giving some advice; but we don't think young men want much advice, and maybe they don't need it. After all, they seem to get along pretty well. So, our heartiest good wishes to the engineers of 1951. May they enjoy engineering as much as we have!

There Is No Better Time than the Present for Public Works Construction

SOME of the faint-hearted are saying that cities and industries should defer the construction of needed waste treatment works. This deferment has been going on too long. There are always plenty of excuses, if that is the way one wants to do business, and plenty of specious reasons for waiting. One favorite argument is that prices may be lower, but that is a thin and unlikely prop to base a policy on. Another argument is that the community is short of money. Well, it always has been and always will be, until some realistic leadership is available to press the claims for waste disposal vs other more attractive sounding and looking, but less urgently needed activities.

We can continue indefinitely citing these defeatist arguments for doing nothing. No one ever got any place doing nothing. What we need is some real leadership in our cities, in our states and in the Federal Government. We need men with courage, resolution and knowledge; men who don't give up because of imagined difficulties. The construction of needed public works is just as much a part of our preparedness and strengthing program as anything else we can do. There is no better time to start; and there never will be.

Something Specific About the Metal Situation

IN 1940, the steel ingot capacity of this nation was 81 million tons; to-day it is 105 million tons per year. By the end of this year the military requirements will approach 20% of this production, or 21 million tons. This will leave for civilian uses 84 million tons or somewhat more than the total 1940 output of steel. Military requirements for copper will increase to over 20% by the end of this year. Domestic production in 1950 exceeded that of any previous period except the peak years of World War II, but is about 15% short of demand. An expansion program in the aluminum industry will add, by 1953, about 60% to the primary capacity existing in 1950. Military demands for aluminum will amount to about 25% of the total supply this year. Increased supply may cause a reduction in the percentage of military use within a year or a little more. It may be noted that, during World War II, military consumption of aluminum was 90% of total production as compared to 25% now.

The tin situation has improved so that second quarter limitations for general use are 90% and for canning purposes 95% of the base period consumption. Lead consumption in 1950 was about 1.3 million tons, an all-time high and about 30% above the 1940 combined domestic consumption, scrap recovery and imports. Lead began to get scarce in the latter part of last year. Zinc demand is greater than production, which is at the rate of about 1 million tons, up about 20% over 1940. Currently less than 15% of this is required for military purposes.

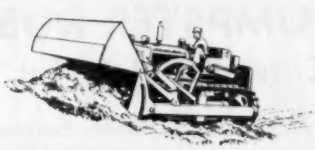
These data are based on the April 1 report of the Director of Defense Mobilization. We believe they represent an accurate picture of the metals situation.

From Ash-Heaps...

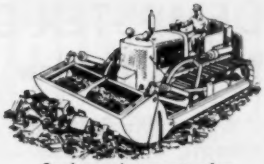
BEFORE AND AFTER— One of Columbus' Bullclams spreads a mountain of garbage before compacting it. Behind and around the International tractor lies garbage that has already been compacted— crushed, smashed, ironed out flat—by the specially curved Bullclam front.

COVER-UP— No garbage in sight now. It's been buried under a layer of clean earth, carried and spread in place by the Bullclam. And now the big red machine tackles the final grading and finishing.

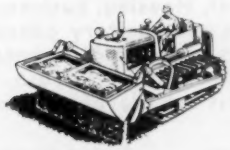
Need more facts about advertised products? Mail your Readers' Service card now.



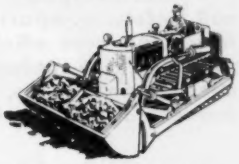
Prepares the site



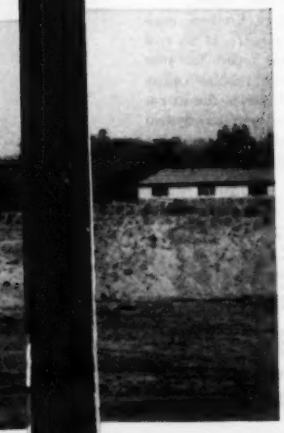
Crushes and compacts refuse



Transports and spreads earth cover



Grades and levels finished area



to Airports

How Columbus, Georgia, builds runways on refuse with a Bullclam unit – the only equipment especially built to do all four steps of the complete sanitary fill job

Old-fashioned garbage disposal at Columbus, Georgia, used to make a considerable area unpleasant and unhealthy. But then Columbus "got Drott" —a Drott Bullclam powered by an International Crawler—the ONLY one-man unit specifically designed to do the complete sanitary fill job.

Disposal costs dropped to a fraction of the old method, and a long-range program of reclaiming wasteland was begun. Low bottom land next to the Municipal Airport was filled in and used for additional runways and for playgrounds. And Columbus was so pleased with its first Bullclam that it soon added a bigger model.

This fast-working equipment scoops out the excavation and compacts the refuse—crushing, smashing, grinding it flat beneath the specially curved Bullclam bucket front. Then the bucket carries the cover dirt and spreads it in place—and the Bullclam front grades it smooth to finish the job.

You do away with open dumps and smelly burners —you raise land values—you cut your city's disposal costs, with a Drott Bullclam on an International Crawler. Ask your International Industrial Distributor about it, or write for details, now.

Drott Manufacturing Corporation
Milwaukee 8, Wisconsin

International Harvester Company
Chicago 1, Illinois

BULLCLAM BY DROTT

POWER BY INTERNATIONAL

POWER THAT PAYS

Now's the time to mail this month's Readers' Service card.

DEMPSTER-DUMPSTER RUBBISH COLLECTION

What It Is—How Cities Use It To Cut Costs, Increase Cleanliness

Cities like Baltimore, Richmond, Nashville, Boston, Cincinnati, Birmingham—to name a few—are spotting big Dempster-Dumpster Containers at Schools, Hospitals, and Hotels . . . Apartment, Housing, Business and Market Areas for more efficient and sanitary collection of bulk rubbish. These containers are eliminating unsanitary trash cans, crates, boxes, rats, scattered trash, open trucks and with it making almost unbelievable savings.

Here is a brief explanation of this revolutionary method of bulk rubbish collection:

Operated By One Man

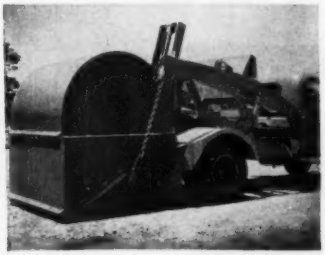
The Dempster-Dumpster System is, simply stated, one or more truck-mounted Dempster-Dumpsters, each with only one man, the driver, servicing any required number of detachable Dempster-Dumpster Containers, ranging in size up to 12 cu. yds. The Dempster-Dumpster makes scheduled calls at housing, market and business areas, hospitals, schools, etc. and picks up each pre-loaded container, hauls it to disposal area where contents are dumped automatically, then returns container to replace another pre-loaded container. This single truck-mounted Dempster-Dumpster services any number of containers, 'one after another.

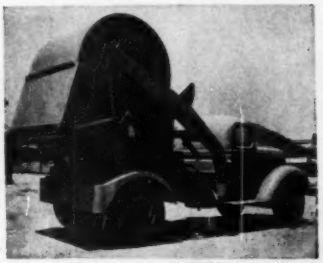
The cleanliness of the Dempster-Dumpster System is due to the completely closed steel containers. Trash and refuse cannot be scattered over streets and alleys by winds or scavengers. Dempster-Dumpster Containers are fire-proof and rat-proof.

System Grows as Needed

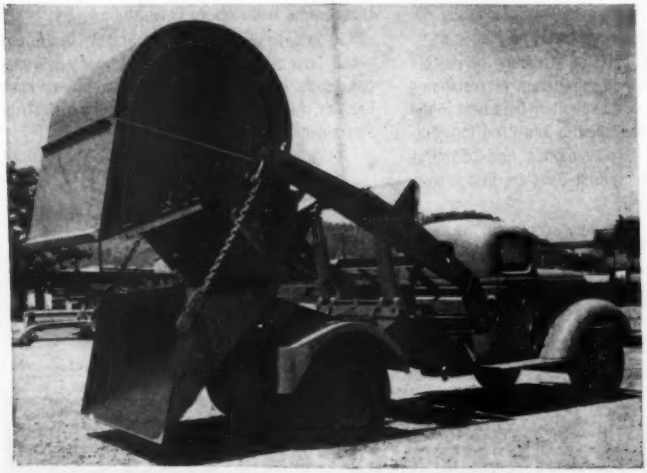
The City of Birmingham started out with one Dempster-Dumpster and 10 containers in 1938. Now Birmingham has 12 Dempster-Dumpsters servicing 204 containers. Richmond, Va. started out with two Dempster-Dumpsters and 13 containers in 1946. Today Richmond has six Dempster-Dumpsters servicing 196 containers. And so on down the line in city after city where the Dempster-Dumpster System is saving sanitation departments thousands of dollars annually. For example, when Richmond replaced the conventional open truck method of bulk rubbish collection in the business area with the Dempster-Dumpster System it cut collection costs from $1.03 to .43 per cubic yard.

The pay-load capacity of the larger Dempster-Dumpster Containers is equal to or greater than conventional truck bodies. It is important to remember that containers are available in many different designs of every desired size. For instance, where moist or wet rubbish is a problem, a Dempster-Dumpster container is built to take care of it. And bear in mind, regardless of the different designs or sizes of the containers you use at various points, one truck-mounted Dempster-Dumpster can service them all.





PICK UP AND HAULING OPERATIONS are shown in the two photos above. Driver backs Dempster-Dumpster up to Dempster-Dumpster Container, which has been pre-loaded by user, slips lifting chains onto lugs at each end of container, then, by hydraulic controls in the cab, lifts container into carrying position and drives to disposal area.



DUMPING POSITION of this 10 cu. yd. Apartment Type Dempster-Dumpster Container is shown above. Its payload capacity is greater than the average conventional truck body. Container is placed in dumping position hydraulically and drop bottom section of container is lower for dumping . . . all under complete control of driver in the cab.

The Dempster-Dumpster System triples man-hour efficiency . . . reduces truck investment, gas, oil, maintenance costs . . . improves "housekeeping" methods . . . reduces fire hazards . . . provides an easier, quicker, safer and more effective manner of handling bulk trash and refuse.

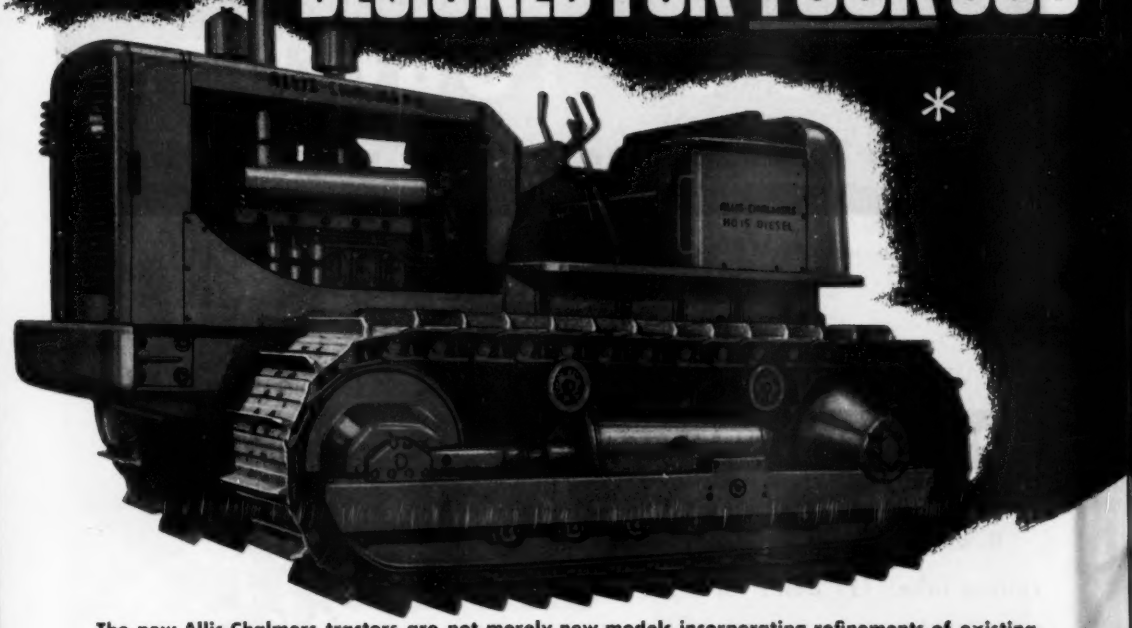
Upon request Dempster Brothers engineers will be glad to prepare, at no cost to your city, a complete report for your particular municipal bulk rubbish collection requirements to determine the extent to which the Dempster-Dumpster System would justify its purchase and just what equipment would be required for efficient bulk rubbish disposal.

DEMPSTER DUMPSTER
TRADE MARK REG.

DEMPSTER BROTHERS
951 Dempster Bldg.
Knoxville 17, Tenn.

Here's what WE mean by

DESIGNED FOR YOUR JOB



The new Allis-Chalmers tractors are not merely new models incorporating refinements of existing ideas . . . they are new from the ground up . . . without compromise anywhere in design or material.

They are the answer to your demands for tractors that will give you outstanding performance on a variety of applications — whatever those jobs may be.

Behind the design are your own ideas . . . and those of your operators and mechanics . . . combined with the vast experience of Allis-Chalmers.

Check the following outstanding features . . . then get the full story from your Allis-Chalmers dealer on this — "THE FINEST TRACTOR LINE ON EARTH."

POWER TO SPARE — A large untapped reserve (up to 1/3 of peak available hp.) assures easier going on toughest work — longer engine life, less servicing. Moreover, it has been proved that General Motors 2-Cycle Diesels are unmatched in lugging ability; they build up torque faster and higher . . . hold it longer.

MATCHED POWER TRAIN ASSEMBLIES — Each and every part of the power train — from master clutch to final drive — has more than enough capacity and strength to handle any load it was ever meant to carry. Bigger clutches, booster steering, double-reduction final drives, all add life—get more work done.

REVOLUTIONARY SHIFT PATTERN — A quick, one-lever shift from any forward speed to any reverse position saves shifting motion and time — smoother and easier, too.

POSITIVE BALANCE — Tractors work equally well with any equipment — drawn or mounted. There's *greater stability* and *traction* with more track on the ground and lower structural weight. Main and truck frames are heavier, truck frames longer . . . idlers are bigger, and both idlers and sprockets lowered . . . all steel construction throughout. Up to 50 percent more ground clearance!

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

The Newest, Finest Tractor Line on Earth!

HD-5 — 40.26 drawbar hp. — 11,250 lb.

HD-9 — 70 drawbar hp. — 18,800 lb.

* HD-15 — 102 drawbar hp. — 27,850 lb.

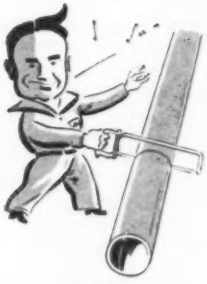
HD-20 — Hydraulic Torque Converter Drive — 175 net engine hp. — 41,000 lb.

- **DESIGNED FOR YOUR JOB**
- **BUILT TO "TAKE IT"**
- **EASY TO OPERATE**
- **EASY TO SERVICE**

TIPS on TUBE USE

HOW TO CUT TUBE

If only hacksaw is available for cutting tube: (1) don't force the cut, the tube will flatten, (2) make cut at right angle; if first cut has faulty angle, try again or square it up with file, (3) after cutting, use knife or file to remove burr — outside and inside. If tube cutter is used, do not apply too much pressure or tube will be forced out-of-round.



Choose good tube first — care makes it last.

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Calumet & Hecla Consolidated Copper Company
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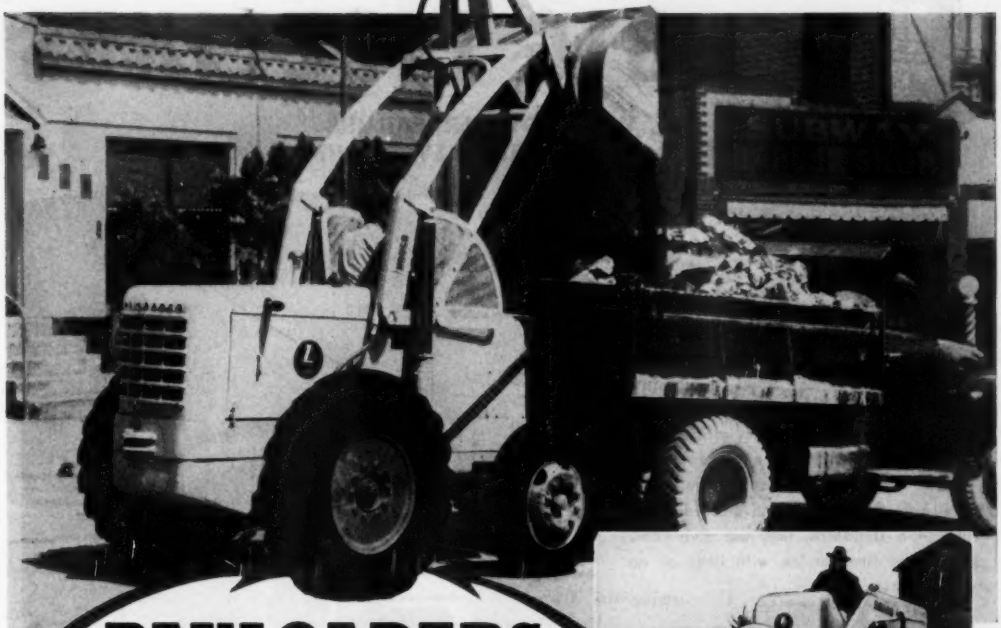
Model HF ¾ yd. PAYLOADER loading excess dirt into truck from a city street.



PAYLOADERS ON RUBBER

Are all-around Performers

Model HM 1½ yd. 4-wheel drive PAYLOADER backfilling a trench.

Performance is the big PAYLOADER feature that has sold hundreds of these special Hough-built tractor-shovels to cities, towns, counties and states . . . their ability to do more jobs faster and better than other tractor-shovels.

One of the big reasons for PAYLOADER superiority is their use of large earthmover tires that give lots of traction and flotation PLUS speed, mobility and economy. They can work and travel safely on streets and get to the job fast under their own power without the use of trailers. Maintenance costs for their pneumatic tires is also less than for crawler tracks especially when used on sand and other abrasive grounds.

When you need a tractor-shovel get PAYLOADER, the complete unit-built tractor-shovel — on *rubber*. There's a size to fit *your* needs. The Frank G. Hough Co., 761 Sunnyside Avenue, Libertyville, Illinois.

WRITE for literature on any size PAYLOADER — the 4-wheel drive 1½ yd. Model HM; the 1¼ yd. Model HY; the ¾ yd. Model HF; the ½ yd. Model HE; the 12 cu. ft. Model HA. There is no obligation.

PAYLOADER®

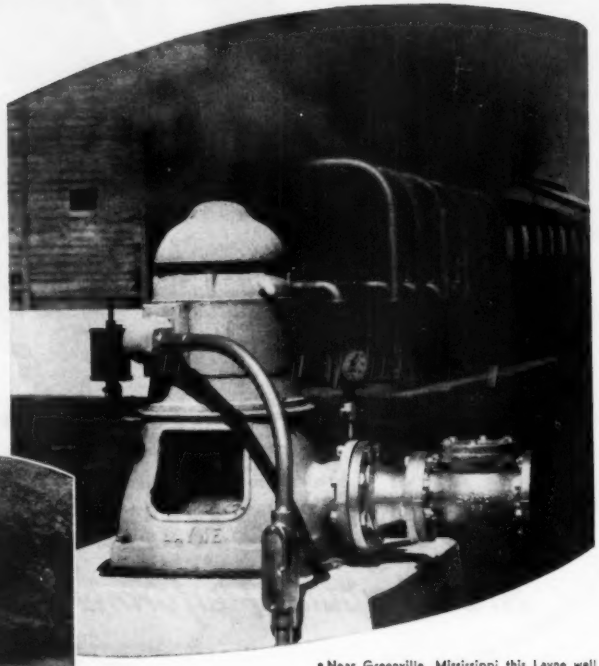
Manufactured by THE FRANK G. HOUGH CO.

Need more facts about advertised products? Mail your Readers' Service card now.

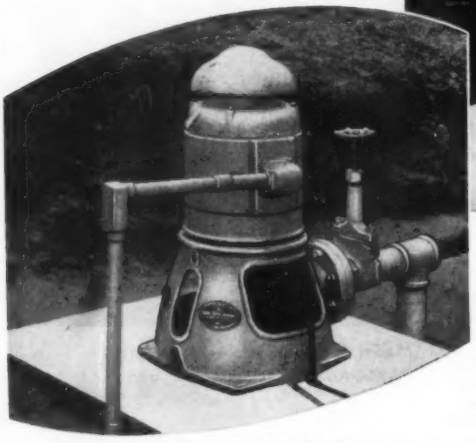
THEY ARE WORKING ON THE BIG PIPELINES

WHERE WATER FAILURE WOULD STOP EVERYTHING

A lot of new Layne wells and pumps are serving the big inch pipelines,—and more are being installed. The selection of these fine water supply systems was based on such features as;—basically sound engineering ideas, higher overall quality, top flight efficiency,—and their ability to handle peak production on an around the clock schedule. Installed by Layne's own field crews and according to Layne's rigid standards, they will give years and years of fine service with little or no upkeep expense.



• Near Greenville, Mississippi this Layne well and pump installation furnishes cooling water for a pumping station on a big inch pipeline.



• This Layne well and pump installation in Gregg County, Texas supplies water for general use on a big inch pipeline booster station.

LAYNE is the Nation's greatest organization engaged exclusively in the designing and building of modern high efficiency well water systems. Layne has made more installations than any other organization in the world and is recognized as being the best qualified of all firms now in the business of developing well water. Such qualifications enable Layne to do every job complete and right, whether for a single unit, a dozen—or hundreds. For further information, new catalogs, bulletins, etc., address

LAYNE & BOWLER, INC., GENERAL OFFICES, MEMPHIS 8, TENN.

NEW LITERATURE

Catalogs and bulletins; Layne Well Water Systems,—Layne Short Coupled Service Pumps,—Layne Oil Lubricated Vertical Turbine Pumps,—Layne Water Lubricated Vertical Turbine Pumps,—Layne Cemented Wells,—Layne Stainless Steel and Monel Metal Shutter Screens,—Layne Ingot Iron Shutter Screens,—Layne Silicon Bronze Shutter Screens,—Layne Irrigation Pumps,—Layne Chemical Treatment for Water Wells,—Layne Water Flow and Pipe Orifice Measurement Hand Book. Sent gratis and without obligation. Please use your Company's letterhead.

Layne
WATER SUPPLY
WELLS & PUMPS

Now's the time to mail this month's Readers' Service card.

Sgt. Robert Chrisman levels a field at the eastern end of the Davison airstrip, Ft. Belvoir, Va., with a "Cat" D7 Tractor. In the background are four "Cat" No. 12 Motor Graders completing runway.

THE MILITARY GETS FIRST CALL

THESE "Caterpillar" earthmoving machines, working on the runway of the Davison airstrip at Ft. Belvoir, Va., show at a glance where a lot of "Cat" equipment is going these days. And that's how it's got to be.

Defense Rated Orders get first call as America's military establishment prepares for what may come. The urgent build-up of our power has meant drafting machines as well as men. An ever-increasing flow of "Caterpillar" equipment and parts is going to the support of America's fighting men and to defense projects.

This means that there already exists a scarcity of "Cat" equipment and engines for civilian use. So it is to *your* advantage to make the machines you now have *last*. You can keep them on the job longer by doing these things:

1 Follow sound and recommended operation and maintenance procedures to the letter. Read and reread your Operator's Instruction Book.

2 Make full use of your "Caterpillar" dealer's facilities for servicing and rebuilding machine parts.

3 Anticipate future parts needs, then contact your dealer and let him help. But *don't* buy or order parts you don't actually need.

Caterpillar Tractor Co. will do everything possible to maintain every "Caterpillar" machine in the field, to provide new machines as fast as possible, and to allocate them as fairly as possible.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

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DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

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CLAY PIPE IS THE *ONLY* PIPE THAT INCLUDES ACID TESTS IN ITS A.S.T.M. SPECIFICATIONS

When you write Clay Pipe into your specifications you've given the best guarantee in the world that the pipe will outlive for years, and even centuries, the investment in the project. The clay itself is chemically inert. By the Clay Pipe Industry's exclusive process of VITRIFICATION, the material is fired and bonded together into the only pipe known that maintains its resistance to corrosion forever. In addition to these basic, unmatched qualities, careful controls over each operation give you denser, stronger, better Clay Pipe — of *uniformly* high quality. You can specify Clay Pipe with confidence, secure in the knowledge that Clay Pipe does not disintegrate from acid attack — that it *never wears out.*

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WRITE FOR DETAILED INFORMATION

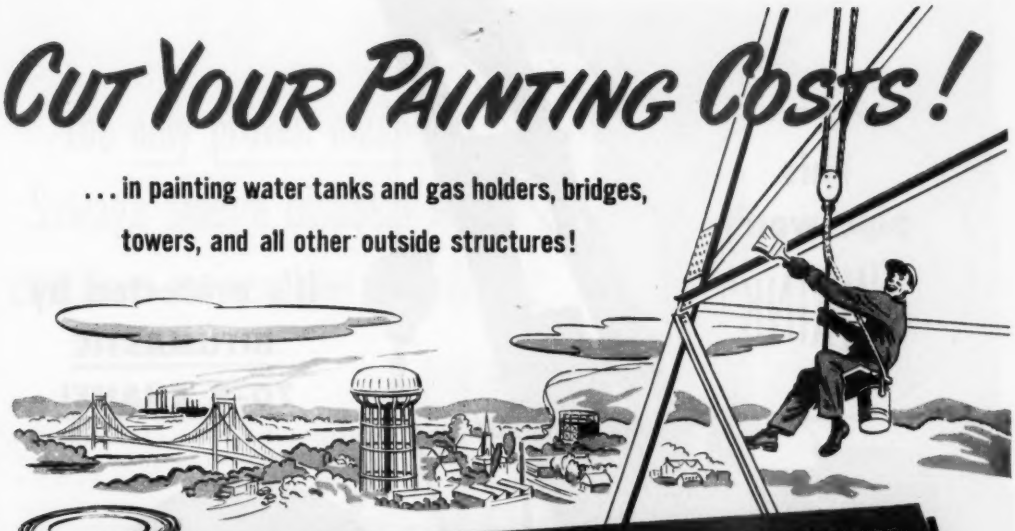
Additional information and data on Vitrified Clay Pipe, Wall Coping and Clay Flue Lining sent FREE on request. State your specific questions. Simply contact the regional office nearest you.

C-451-1

Now's the time to mail this month's Readers' Service card.

CUT YOUR PAINTING COSTS!

. . . in painting water tanks and gas holders, bridges, towers, and all other outside structures!



Available in a wide range of colors.

BIG SAVINGS ACHIEVED WITH LONG-LIFE DIXON PAINTS! SEE THESE TYPICAL SERVICE RECORDS

- ✔ **15 YEARS SERVICE** — Water tank exposed to severe salt water conditions
- ✔ **10 YEARS SERVICE** — Elevated water tank near salt water
- ✔ **16 YEARS SERVICE** — 3½-mile bridge. Highly concentrated industrial area
- ✔ **7 YEARS SERVICE** (and Dixon still going strong!) — 5,000,000 cubic foot gas holder
- ✔ **17 YEARS SERVICE** — Railroad bridge subject to smoke and fumes
- ✔ **7 YEARS SERVICE** (still in excellent condition!) — 1 million gallon standpipe. Open area; high winds

Service records like these mean rock bottom maintenance costs. Others have greatly lengthened time between paintings; saved thousands of dollars—by using long-life Dixon Paints. *Why not you?*

In enduring Dixon paints you get:

1. The time-proved ability of *Natural* Flake Silica Graphite to protect outdoor structures against punishing weather and atmospheric conditions.
2. Almost a century of specialized experience . . . concentrated on the job of making better *outdoor protective paints!*

It will pay you to investigate. Mail coupon.

DIXON

FLAKE SILICA GRAPHITE PAINTS

NOW . . . AN ALL-PURPOSE ENAMEL!

Yes, one highly-enduring enamel for *all* purposes. A notable Dixon Research achievement. Enables you to cut down enamel inventory. For both exterior and interior work. For hundreds of applications—fire hydrants, benches, machinery, piping, floors, etc. Wide variety of colors. *Mail coupon for information.*

JOSEPH DIXON CRUCIBLE COMPANY (Dept. 5P)
Paint Division, Jersey City 3, N. J.

Please send me: ☐ Information about Dixon Flake Silica Graphite Primers and Paints. ☐ Information about Dixon *All-Purpose* Enamel. ☐ Water tank repainting and specification contract forms. ☐ Have your salesman call.

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SPECIALISTS IN OUTDOOR PROTECTIVE PAINTS — FOR ALMOST A CENTURY

Thousands use our Readers' Service card to keep up to date . . . do you?

THE 36-inch steel pipe pictured here is part of a new water line being laid for a well-known midwest water works. This new pipe line is about 6,000 feet in length and is protected, inside and out, by Bitumastic® 70-B Enamel.

Inside the pipe, a glass-smooth lining of Bitumastic 70-B Enamel prevents rust, corrosion and tuberculation. This spun lining of durable enamel will *keep* flow capacity high, thus reducing pumping costs. And, with this kind of protection, there's no need to spend money for *oversized* pipe in order to allow for future "shrinkage."

On the outside of the pipe, Bitumastic 70-B Enamel prevents pitting and leakage caused by soil corrosion. Here, again, you save money by keeping maintenance and replacement costs low. In every way, it pays to protect *your* community's large-diameter pipe lines *inside* and *out* with Bitumastic Enamels.

KOPPERS BITUMASTIC ENAMELS
REG. U.S. PAT. OFF.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 555T, Pittsburgh 19, Pa.

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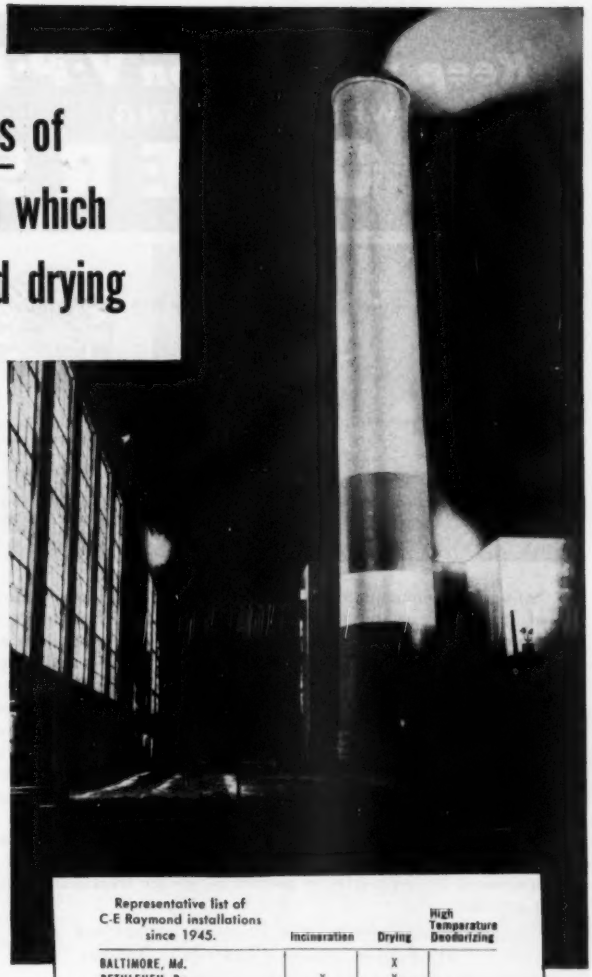
the only proven means of Sewage Sludge Disposal which combines incineration and drying



As will be seen by the list at the lower right, there have been seven major installations of C-E Raymond Systems in the last five years which combine the two usual disposal methods . . . drying and incineration. The C-E Raymond System usually provides for high temperature deodorizing employing preheater equipment to save fuel and assure low stack temperatures.

C-E Raymond System installations are in service in virtually all parts of the country, meeting the varying requirements of both large and small communities. They are flexible in layout, highly efficient and thoroughly reliable; they provide for maximum utilization of waste heat.

A major reason for the success and widespread acceptance of C-E Raymond Systems is the exceptional background of experience represented in their design and manufacture. The Raymond Division has long been a recognized leader in the fields of grinding and drying, and Combustion Engineering—Superheater, Inc. has enjoyed similar standing in the combustion and heat recovery fields. The services of C-E specialists are available to assist you in finding the best solution to your sludge disposal problem. B-464

Representative list of C-E Raymond installations since 1945.	Incineration	Drying	High Temperature Deodorizing
BALTIMORE, Md.		X	
BETHLEHEM, Pa.	X	X	
CHICAGO, Ill. (W. Southwest)	X	X	
FOND DU LAC, Wis.		X	X
HOUSTON, Texas		X	
LOS ANGELES, Calif.	X	X	X
SAN DIEGO, Calif. (Extension)		X	X
SAN FRANCISCO, Calif.		X	X
SCHENECTADY, N. Y.	X	X	X
SHEBOYGAN, Wis.		X	X
WATERBURY, Conn.	X	X	X
COLNE VALLEY, England	X	X	X
RECIFE, Brazil		X	
WASHINGTON, D. C.	X	X	

Industrial sludges a problem?

C-E Raymond Flash Drying and Incineration Systems have been the answer for others. Write for information.

C·E

COMBUSTION ENGINEERING—SUPERHEATER, INC.

FLASH DRYER DIVISION

1315 North Branch Street Chicago 22, Illinois

Western Office: San Fernando Bldg., Los Angeles 13 Eastern Office: 200 Madison Ave., N. Y. 16

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

Get full details of this month's new products . . . mail your Readers' Service card today.

Keep your eye on V-P-I
WHEN SELECTING
BLOWERS

CENTRIFUGAL

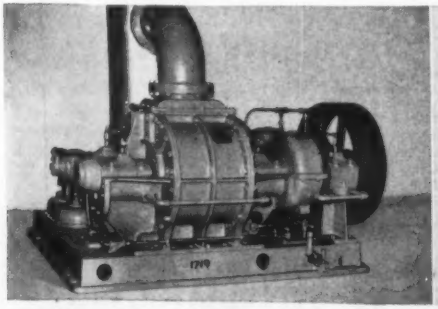
This Type H, 3-Stage Centrifugal Blower, with capacity of 15,000 cfm, is one of many R-C units used by this large eastern city in sewage treatment service.

Sewage treatment plants can't afford to risk shutdowns because of unsatisfactory or inadequate equipment performance. To maintain required rates of flow, calls for blowers that continuously deliver positive Volume at required Pressure—and at Low power costs to reduce operating expense.

You get these 3 essentials from R-C Blowers. Whether your needs call for Centrifugal or Rotary Positive units, we can match them from our exclusive *dual-ability line*. With capacities from 5 cfm to 100,000 cfm, you can usually find R-C units that closely fit your demands, with resultant savings in time, cost, space, weight and power.

From an experience of almost a century of blower building, our engineers will gladly make suggestions of the right R-C equipment for industrial or municipal sewage treatment plants of any size.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Poplar Avenue, Connersville, Indiana



ROTARY

Type RCDH Rotary Positive Blower installation in sewage treatment plant in central New York City. Capacity 2,000 cfm.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

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LETTERS

TO THE Editor

COMMISSIONS FOR ENGINEERS

I have just read the article "How Engineers Can Apply for Commissions" and you are to be highly commended for your interest in conserving our supply of young engineers. We in the Public Health Service are deeply interested in this matter. In order to give fuller information than that available to you when you prepared your article, I am enclosing a statement which covers the general eligibility requirements for appointment in the Public Health Service and supplements the information previously sent you.

Richard J. Hammerstrom,
Senior Sanitary Engineer,
Division of Commissioned Officers,
U. S. Public Health Service.

Ed. Note: The information furnished by Mr. Hammerstrom is published elsewhere in this issue under the title "How Engineers Can Apply for Commissions."

I have read with much interest the editorials in your February issue and also the story on page 53, outlining the procedures to be followed by engineers in applying for commissions. This is excellent mterial and you are doing a good service to engineers who are interested in commissions in the armed forces. I hope that you can keep this information current through the medium of Public Works.

R. E. Lawrence,
Black & Veatch,
Consulting Engineers,
Kansas City, Mo.

SEWAGE PLANT OPERATION

The article "Operation of Sewage Treatment Plants in your October, 1950, *PUBLIC WORKS*, gives the most understandable and complete information necessary for operators that I have ever seen. We started operation of a new sewage treatment plant in August, 1949, with a crew of completely inexperienced operators. Had we had this text at that time, my task of breaking in these operators would have been greatly simplified. When the article did be-

Another Helping Hand in BOYS TOWN

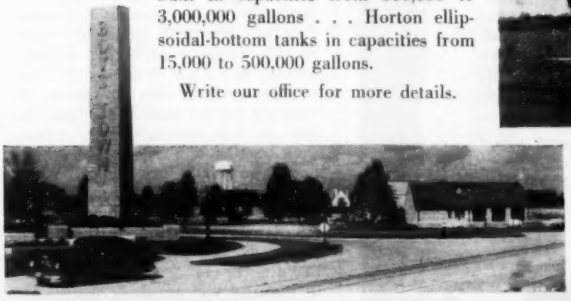
LIKE many modern communities, Father Flanagan's Boys Town relies on nature's own gravity pressure to assure more dependable and economical water service.

All water for the system is supplied by adjacent Omaha, Nebraska. Then, with the help of the Horton elevated tank shown at the right, this water is delivered under gravity pressure throughout the distribution mains.

Water tanks with radial-cone bottoms, similar to the Boys Town installation, are particularly adapted to larger systems because they hold greater capacities without an excessive range-in-head. The result is lower pumping costs. Combine this advantage with 'round the clock service . . . and it's understandable why so many communities are adopting elevated storage in their water systems.

Horton radial-cone bottom tanks are built in capacities from 500,000 to 3,000,000 gallons . . . Horton ellipsoidal-bottom tanks in capacities from 15,000 to 500,000 gallons.

Write our office for more details.



THE STORY of the inception and growth of Boys Town belongs to Father Flanagan. It was through his tireless efforts that this boys' community grew from one five-story building in 1927 to today's 67 buildings. Now over 500 boys enjoy the benefits of his great work.

HORTON

WELDED STEEL

STORAGE TANKS

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3.....2123 Healey Bldg.	Los Angeles 14..1508 General Petroleum Bldg.
Birmingham 1.....1532 North Fiftieth St.	New York 6.....3316-165 Broadway Bldg.
Boston 10.....1038-201 Devonshire St.	Philadelphia 3...1648-1700 Walnut St., Bldg.
Chicago 4.....2115 McCormick Bldg.	Salt Lake City 4....539 West 17th South St.
Cleveland 14 .....2221 Guildhall Bldg.	San Francisco 14 .....1525-200 Bush St.
Detroit 26 .....1536 Lafayette Bldg.	Seattle 1.....1339 Henry Bldg.
Havana .....402 Abreu Bldg.	Tulsa 3.....1641 Hunt Bldg.
Houston 2.....2142 National Standard Bldg.	Washington 6, D. C. .....1120 Cafritz Bldg.

Get full details of this month's new products . . . mail your Readers' Service card today.

BONDED PERFORMANCE

"A Saving and Timely Public Service"

Taxpayers and public officials alike will be interested in this editorial from the Tampa (Fla.) Morning Tribune, March 8, 1951.

A Timely Public Service

We do not often single out a private business enterprise for special commendation, but it is sometimes fully merited. It is proper and just in the case of the timely public service given by the National Surety Corporation, in the case of the city's sewer system.

When the original contractor for a large part of the sewer construction job encountered financial difficulties and had to default on the contract, the surety company stepped in immediately upon the call of the city officials and prevented a complete stoppage of the work, which involved the disposal plant and eight outlying pumping stations. The company carried the payrolls and assured material dealers that past-due accounts would be protected.

Officials and engineers of the National Surety Corporation came promptly on the scene from the head office in New York and, with the cooperation of the local agent and the city officials, made a new contract with a strong local construction firm to take over and finish all the structures involved in the defaulted contract. It is not practical for all contractors to have sufficient financial resources to make owners safe from any loss, but it is practical and required by law that surety companies be financially able to indemnify the owners against any loss through default of contractors they insure. That's just what this company did in the Tampa sewer contract—and we commend it for giving a saving and timely public service to the city of Tampa.

NATIONAL SURETY CORPORATION

4 Albany Street, New York

AGENTS OR BRANCH OFFICES LOCATED IN ALL PRINCIPAL CITIES AND TOWNS

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come available, it was made required reading for the operators and it did much to clarify the purpose of the operational procedures already in practice. Is this text available in book form and where may it be obtained?

L. D. Working,
Sup't. Sewage Treatment Plant, Niles, Michigan.

Ed. Note: This is available, at present, only as published in Public Works Magazine.

BEACH REFUSE

I would appreciate receiving all information available on beach refuse collectors.

G. B. Weimer,
Ass't. Purchasing Agent, City of Clearwater, Fla.

FROM AN AUTHOR

Personally I think you have a "touchdown plan" in paying for technical articles and you may be sure that if I have any information in the future which I think will be interesting to your readers, *PUBLIC WORKS* will be given first chance at it. In fact, you will receive one from me shortly. In the meantime, will you tell me the cost of reprints of my article in the February issue?

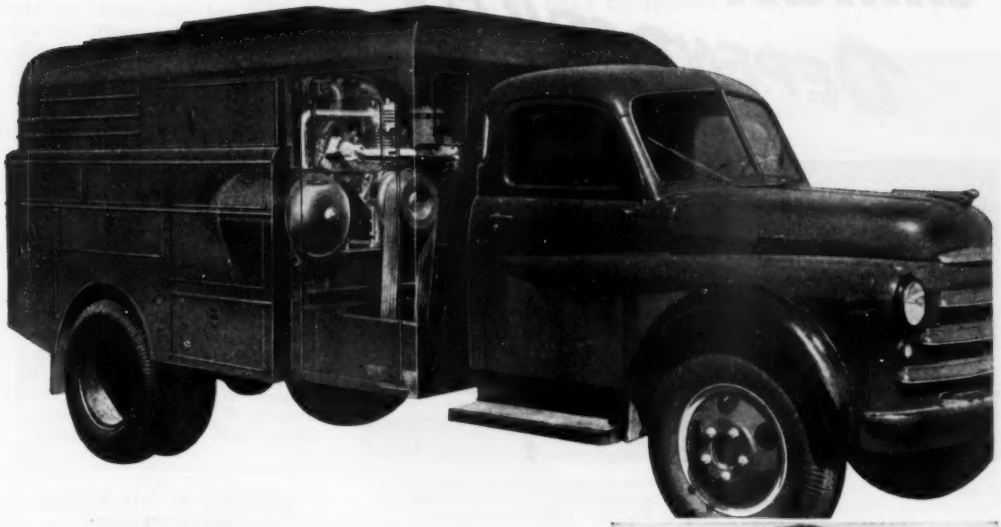
James G. Cooney,
Consulting Engineer, Belleville, Ill.

SWIMMING POOLS

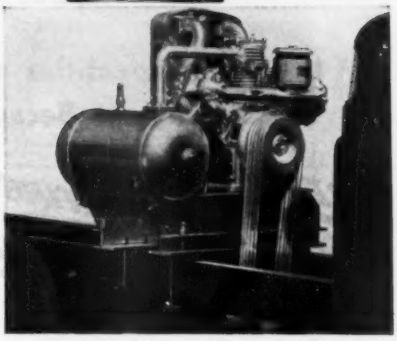
There is a tendency, in discussing swimming pool maintenance and sanitation, to emphasize recirculation systems and chemical treatment, perhaps to the neglect of other factors which are certainly not less important from the sanitation or business viewpoints. More business can be lost through dirty toilets than because of a cloudy pool water, and who shall say which is of greater sanitary import.

Here are a few items in pool maintenance which can produce dividends, and there are others not listed here. (1) Are toilets sufficient in number and properly dispersed; are toilet rooms light and airy; do seats need replacement; do flush valves work; and do flush tanks leak? (2) Are all floors properly drained or are there depressions in which puddles accumulate; are there enough hose outlets to facilitate washdowns; are furniture and lockers designed and placed so as not to interfere with sanitation? (3) Is accessory equipment safe; do floor

If your crews use air tools, here's big news—



Your truck's engine powers this compressor!



****Lower first cost*** . . . no compressor engine, clutch, battery, starter, fuel tank or cooling system to buy — no trailer.

****Half the maintenance*** . . . no compressor engine, clutch, battery or cooling system to service. No trailer running gear to lubricate, no tires to wear or replace.

****No compressor engine cooling system*** to guard against freezing in cold weather.

****More use from your truck engine*** . . . which usually stands idle 7 out of 8 hours.

****No time lost*** . . . compressor, service truck and men arrive at the job together. And, no waiting for compressor engine to warm up.

It's the famous Jaeger "New Standard" Compressor — heavy-duty, 2-stage, precision built. Furnishes 125 cfm of 100-lb air, instead of old standard 105 cfm. With that extra air, tools strike harder and faster, do 30% to 40% more work daily.

It's ready to mount compactly on your service truck and get power from the truck's engine through a simple, rugged power-takeoff unit — job-proven in hundreds of installations.

A long-needed type of compressor. Large users are already standardizing on "Travel-Air" for big savings and real operating advantages.

"Travel-Air" mounts on five popular makes of 1½ and 2-ton-rated trucks — easily adapts to your special truck body designs.

Power-takeoff unit is husky and simple. Only 4 moving parts other than its heavy duty ball bearings. No gears — no power losses.

Two simple controls — both in the cab. One selects rear wheel or compressor drive, the other actuates automatic control of engine compressing speed.

Engine compressing speed automatically regulated to maintain steady 100-lb air. Top compressing speed of the engine is about 1750 rpm — a mere 24 mph on the speedometer.

Write for Bulletin TC-1 and complete information.

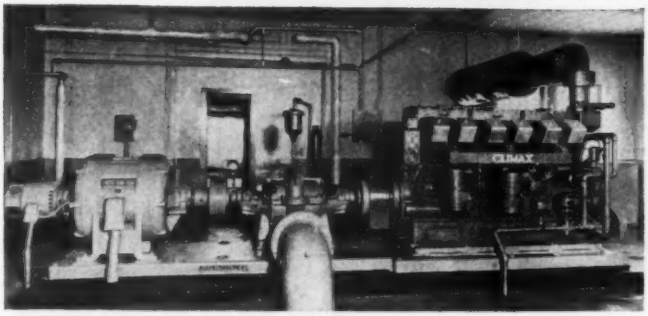
The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio

JAEGER "TRAVEL-AIR" COMPRESSOR

Sold and Serviced by Distributors in 130 Cities of United States and Canada

Need more facts about advertised products? Mail your Readers' Service card now.

climax DEPENDABILITY



Climax Blue Streak 12 cylinder engine as standby for 5500 G.P.M. High Head Service Pump at Michigan City Water Works.

More Municipalities are Selecting Climax Engines Because of Their...

FLEXIBILITY
QUICK STARTING
LOW COST MAINTENANCE

In municipal water works plants Climax Blue Streak Engines drive generators and pumps in standby service, or furnish continuous power where natural or by-product gas is available.

Climax Engines are recommended for direct connection to individual pumps or through disconnect, free wheeling or automatic clutch couplings to motor driven pumps, where the motor is used for normal operation and the engine for emergencies.

For water works service Climax Engines are the choice because of their low upkeep expense, extra quick starting and sufficient surplus capacity to supply power for an indefinite period of time.

Service records show many installations have rendered reliable service for over 15 years.

Write for complete information and specifications on these dependable power plants. There are 4, 6, 8 and 12 cylinder engines, rated from 40 to 600 HP, operating on natural gas, Butane or gasoline. Sewage gas engines are *available* in sizes 40 to 250 HP.

climax ENGINE AND PUMP MFG. CO.

Factory and General Office
Clinton, Iowa

Regional Offices
Chicago - Dallas - Long Beach, Cal.

Now's the time to mail this month's Readers' Service card.

racks or mats need repair and replacement; are diving boards securely supported; are pool ladders safe and not corroded; or do treads or bolts need replacement? (4) Are floor surfaces too rough, or too smooth, and are they properly graded?; have surface coatings withstood wear adequately; (5) Are drinking fountains of sanitary design adequate in number, properly located and suitably drained?

Joseph J. Weinstein,
New York, N. Y.

CD BIBLIOGRAPHY

A 9-page bibliography of twenty-five 16mm sound films on civil defense and innumerable books and pamphlets dealing with the various phases of Civil Defense has been compiled by the British Information Service, 30 Rockefeller Plaza, New York 20, N. Y. This will be sent on request and without charge.

LEADERS IN THE PUBLIC WORKS FIELD

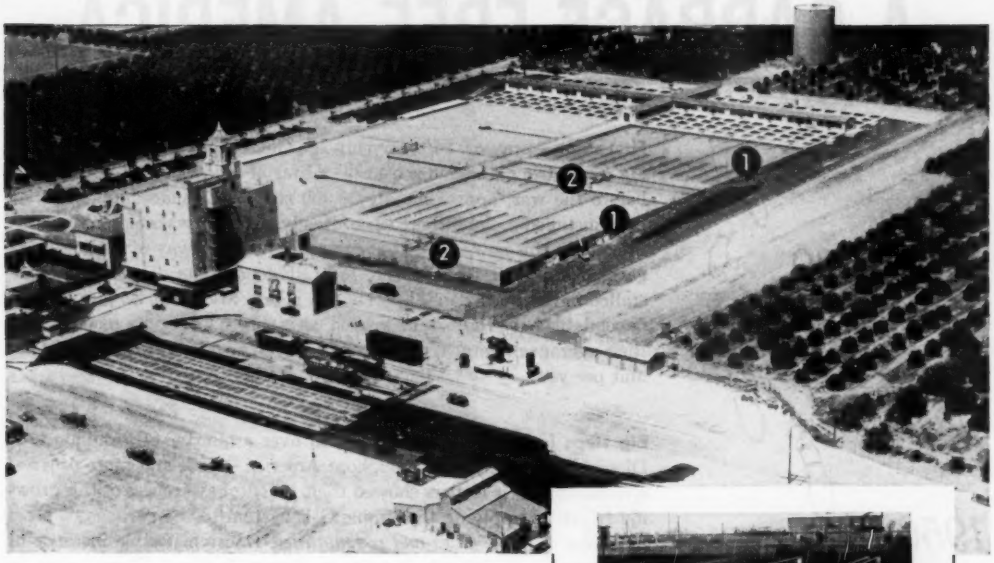
James C. Harding, as Commissioner of Public Works, supervises all of the engineering and construction work and has charge of much of the maintenance of Westchester County, N. Y., one of the nation's richest counties. The roads, bridges, sewer system, sewage treatment plants, buildings and major airport are valued at over $150,000,000. Compared to all the 48 states, Westchester County has a larger population than 10, a larger budget than 12, and a larger assessed valuation than 31.

In the background is a long-time experience as a consulting engineer. Beginning with Fuller & McClintock, he later practiced with his father in the municipal field, specializing in water works and sewerage, being particularly active in the field of underground water. In 1946, he was awarded the Diven Medal by the AWWA for his work in developing standard specifications for deep well construction.

He is a member of many technical and professional societies and active in a number of them. Among his favorite hobbies are canoeing and fishing.

World's largest water softening plant

doubles capacity with LINK-BELT equipment

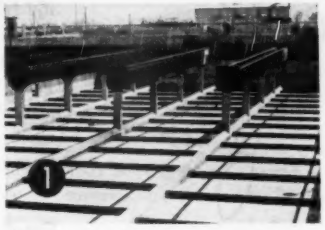


Selects Straightline Mixers and Collectors to get better quality of water

TO MEET the demands of its rapidly expanding population, Southern California's Metropolitan Water District recently added another 100 mgd capacity to their water softening plant at LaVerne. And, as in many of the country's most efficient water treatment plants, Link-Belt Sanitary Engineering Equipment was selected for the mixing and sedimentation tanks.

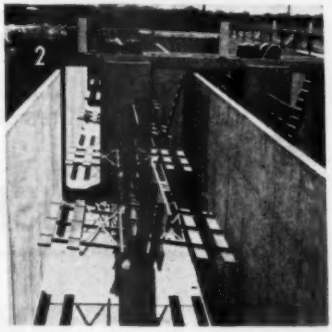
Straightline Mixers and Collectors are only two items in the complete Link-Belt line for water, sewage and industrial liquids treatment. All are designed and manufactured to the highest standards of precision. All are built with Link-Belt components—chains, drives, bearings, conveyors—for positive results and top efficiency.

Our sanitary engineers will be happy to work with your engineers, chemists and consultants. Drawing upon the complete Link-Belt line . . . and over 30 years' experience in this field—they'll help you get the best in modern treatment equipment.



Two 200 x 200 ft. settling tanks at LaVerne have Straightline Collectors *(above)*. Peak-cap bearings, pivoted flights and "Straightline Action" mean top efficiency.

Straightline Paddle Mixers *(below)* provide gentle rolling action in two 48 x 200 ft. mixing tanks. Drive units for all tanks are Link-Belt Electrofluid Drives with "Cushion Action".



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1951-195?

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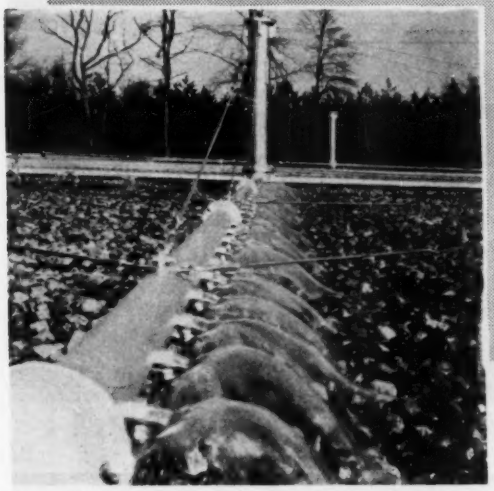

Two 130' Carter distributors installed in Richmond, Va. plant of Henrico Sanitary District #5. R. Stuart Royer, Engineer

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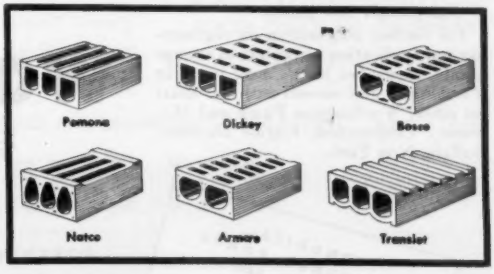

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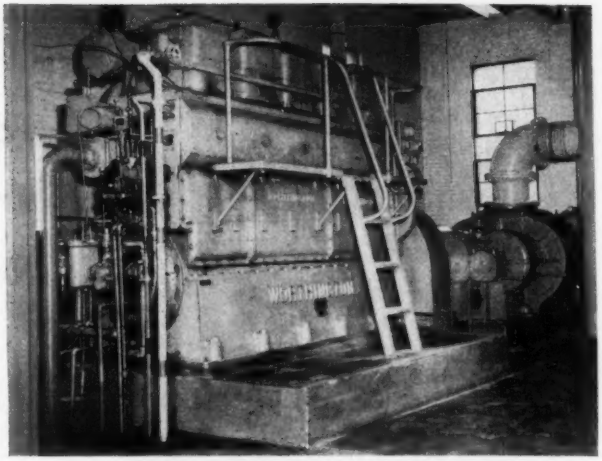
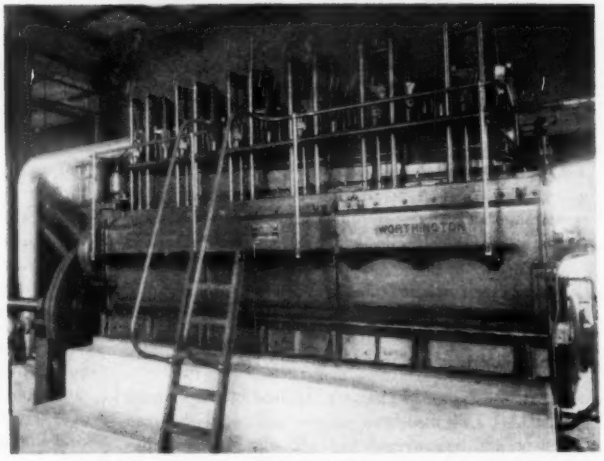
For further information on engineering and application of engines in sewage plants, remember *there's more worth in Worthington* and consult with our nearest office. Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.



Phoenix, Arizona Sewage Department installed Worthington Dual Fuel Engines in 1949 to drive blowers.



Peoria, Illinois Sanitary District installed this Worthington Gas Engine in 1935 to drive blowers.

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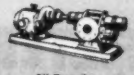

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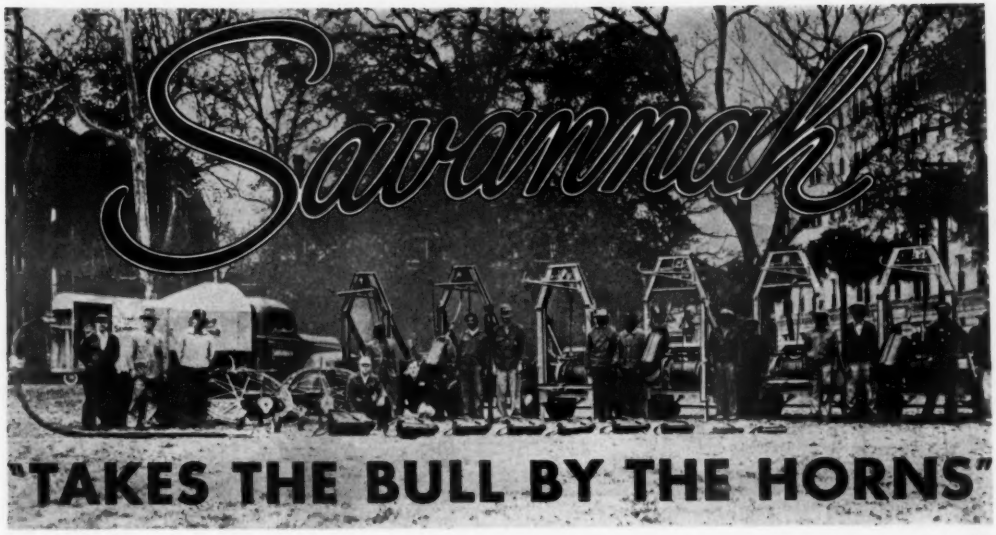

BOOSTS SEWER MAINTENANCE 75% WITH NO INCREASE IN BUDGET!

BULL STREET runs through the heart of old Savannah. Many sewers that serve this section of town are nearly a hundred years old—and, considering the recent growth of the city, severely overloaded. Collections from low-lying areas, additions of storm and sanitary sewers, sand deposits, dense root growths and other debris greatly reduced the efficiency of already overtaxed lines. City officials saw need for action.

They carefully studied all types of sewer cleaning equipment and selected **"FLEXIBLE"** Power Bucket Machines, SeweRodeR, Steel Rod Sets and power drive tools. Previous experience with the city's original Power Bucket Machine assured them of safe operation on old sewers where joints are not too tight. "Flexible's" operating speed of 125 feet per minute in moving loaded buckets assured them of economy too and helped point the way to increasing the efficiency of sewer cleaning crews by 75%.

That's why city officials literally "took the Bull by the Horns" and bought enough equipment to begin one of the most thorough and extensive sewer cleaning operations of any city in the United States!

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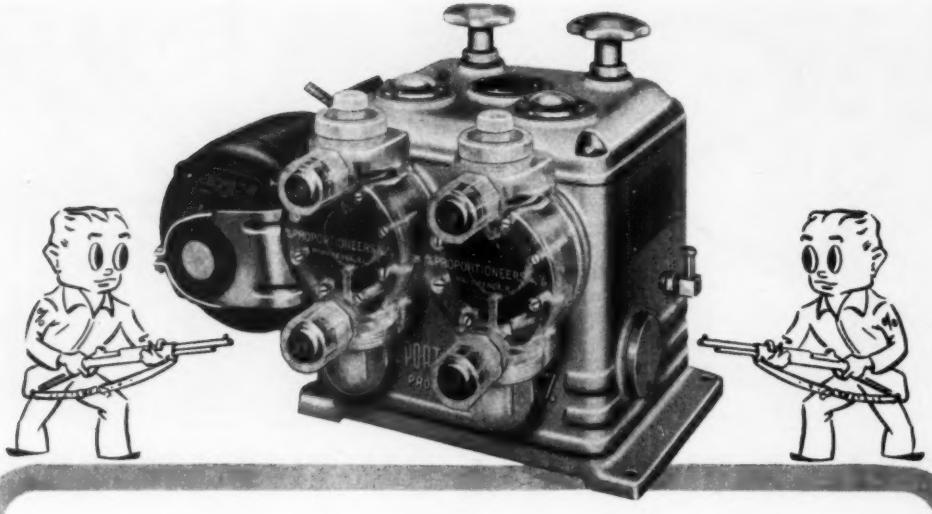

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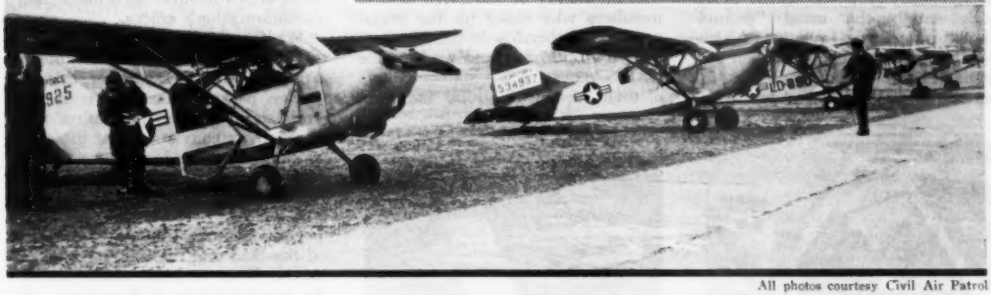
PUBLIC WORKS
Magazine
VOLUME 82 • No. 5 MAY, 1951



All photos courtesy Civil Air Patrol

● *CD communications readiness test, 28 Jan., 1951. Left to right: Major Buell, Lt. MacRae, Major Reardon, Capt. Walker (in plane) and Lt. Col. Mercier.*

CAP - Mobile Support for CIVIL DEFENSE

CAPTAIN SHALE L. TULIN and LT. HAROLD B. NELSON

THE resources of Civil Air Patrol, nationwide auxiliary of the U. S. Air Force, have been placed at the disposal of Civil Defense agencies as support to that organization's requirement for air power. Early this year Civil Air Patrol, with technical guidance from National Headquarters, strengthened its Mobile Support Unit system throughout the 52 wings in each state and territorial possession.

The fundamental value and utility of the CAP MSU lies in its speed and mobility. In the event of disaster—atomic or otherwise—the nearest CAP MSUs would be alerted and sent to the scene, airlifting most of their personnel and much of their equipment to aid in relief at the disaster site and evacuate as many victims as possible.

This package of civil air power comes under the command of a CAP Mobile Support Unit Commander who has air and ground echelons at his disposal. His right hand man is a radiological special assistant, since the MSU structure is beamed toward air in the worst type of attack or disaster. The alerted MSU would send 15 light airplanes and 17 pilots, with adequate reserves of maintenance equipment and personnel, in the CAP "Sunday punch" for civil defense.

Both pilots and planes would be of such characteristics as to be operational under "tight" conditions, such as short fields (or no field at all, but just a road), bad terrain conditions, or unfamiliar territory in which to fly the mission. To meet those stringent conditions, commanders at various levels have been cautioned to schedule—either for training or the actual thing—only those pilots who are well qualified in their type of aircraft and who possess experience in emergency operating conditions. In the ranks of 44,000 active senior members there is no dearth of expert pilots in any part of the CAP framework.

Support in Disaster

In the ground echelon, under separate command, the MSU would send into action, against the disaster, teams of CAP technicians well trained in problems of transportation, communications, reconnaissance, rescue, first aid and messing. Both ground and air echelons in in CAP MSUs have their fire fighting teams.

In support of the total picture, and in constant service to CAP units and the public, are the 7000 radio stations of CAP's radio network. Through this net, isolated units and communities — which otherwise would be without benefit of emergency communications—have means of immediate radio aids. Only last winter Civil Air Patrol's radio net came through under emer-

gency conditions to provide the only communications for a Mississippi railroad during an ice blizzard.

CAP plans ahead while preparing to do its part for immediate possible assignments in Civil Defense. A continuing program of recruitment for a Cadet Corps of 100,000 members already has brought in 30,000 youths between the ages of 15 and 18. A thorough syllabus of training is provided, administered by CAP senior members, Air Force Reserve officers or aviation courses in secondary schools. CAP cadet work entails the usual "ground school" subjects of aviation, which are directed toward preparation for further aeronautical pursuits or merely life in the Air Age.

● ***PLANE radios description of terrain to ground.***

● ***GETTING taxi instructions from ground control.***

CAP is a flying organization. Along with such resources as its senior membership of 44,000 actives, 30,000 cadets, 7000 radio stations and a wealth of knowledge and experience in aeronautical lore are CAP's 4000 privately owned aircraft. Supplementing these two to five-place craft are numbers of Air Force surplus aircraft on loan to units at various levels.

To serve evidence of Civil Air Patrol's ability as an "organization in being" to meet assignments of defense NOW, airmen of that organization have flown on 65 percent of all the Air Force's search and rescue missions of the past several months, in many cases actually earning the honor of locating the missing aircraft. On one recent air search in Texas, Civil Air Patrol was authorized to conduct a mission in the Panhandle without aid of USAF in any of the air or ground phases. An hour and 20 minutes after the difficult search began a CAP flyer located the body of the airline pilot, who fell from his airplane while attempting to secure the cabin door.

Who are the people who make up Civil Air Patrol? From the earliest days of CAP in World War II, they have been volunteers—aviation enthusiasts of all ages who give this form of "civil air power" an organized force of technicians and aircraft. They are aviation's enthusiasts. The cadets are between the ages of 15 and 18 years—making up the "younger set" in CAP. And there are plenty of CAP'ers who are up in their 70's—active CAP members and, many of them, airmen in their own right.

In between these age groups are the thousands of Civil Air Patrol members who make up the major part of membership in the 52 wings of CAP. Both men and women, the CAP Seniors are the staff members of flight, squadron, group and wing levels. During the week they are physicians, carpenters, housewives, secretaries, lawyers, laborers, among many other everyday endeavors.

Comes the weekend or CAP meeting night and the member—perhaps he or she is a captain or staff sergeant in the Patrol—dons a uniform almost identical to the U. S. Air Force and takes up a CAP duty with his or her unit. A great percentage are pilots and aircraft owners. They fly. They also make it possible for other non-flying members to gain experience in the air as observers. Most of the pilots work on individual flying proficiency around the airport or cross-country, but an additional type of activity works to improve the airmen's efficiency in a collective manner. Maneuvers are patterned in the form of a "problem" in which various members of CAP planes are flown in the execution of the day's work. These are generally practice search missions or cross-country proficiency courses.

But the housewife or Ford dealer who puts on the uniform of a CAP captain on Saturday may not have a flying assignment in the Patrol, but many still render invaluable service to the organization—let us say—in Lincoln, Nebraska. Mrs. Homemaker, turned captain for the day, may be the squadron adjutant or public information officer. Her duties are in administration, somewhat similar to administrative practices of the military. She has learned to write and indorse letters in the military manner; operate a filing system for her unit; keep an active record section in being at all times.

Dr. Doyle Dentist, also, may not fly in CAP, yet he may be his unit's most active member as a major and communication's officer.

Whether a CAP colonel or corporal, the individual is a volunteer. For ten years, in December, this air power package has grown in its enthusiasm for civil aviation and through its conviction that the civil auxiliary can render service to national defense in peace or war.

Perhaps the outstanding feature of Civil Air Patrol is its wide disposition over the length and breadth of the land and the Territories. The Army, Navy and Air Force are to be found in each of these areas, in some to a great density. But CAP is perhaps the only flying organization which finds its way into *each* state and almost every county and community of considerable size. Because of this feature the organization, with its radio network of more than 7000 stations, has an inherent value to Civil Defense and the organized air structure of the nation.

While the tendency in aviation today is toward the technical phases, and defense is always a somber subject, CAP has its "fun" side, too. With summer comes the Civil Air Patrol air shows, always a weekend highlight of a unit's season of activities. Summer brings the International Cadet Exchange with other nations—the International Drill Competition with the Air Cadet League of Canada—the two-week encampments at Air Force bases. These are CAP Cadet activities, the type of thing which has dynamic appeal for action-loving youth.

Altogether, the Civil Air Patrol program, built around people who have a devotion to aviation, strives to maintain a structure adequate to and deserving of its official affiliation with the U. S. Air Force—that of civlian auxiliary. More than 100,000 active CAP "citizen airmen" attest to the worthy causes which have kept Civil Air Patrol eager for a decade. The organization looks forward to many more such eras of volunteer service to aviation in the United States.

Supplying INDUSTRIAL WATER to Tacoma

● ***TRENCHING for the pipe line with ¾-yd. backhoe.***

A. R. MacPHERSON

TACOMA, Wash., is noted the world over for the cheapest electric power rates. It has attracted many new industries in recent years, particularly, industries requiring large amounts of cheap electric power such as chemical, smelting and aluminum plants. Along with the increasing number of industries comes the demand for greater amounts of water for industrial uses.

Tacoma has also been blessed with abundant supplies of water the year round from many nearby sources, as rivers originating in adjacent mountain ranges and many local water wells, some of which are very large producers. But having so much water is of little use unless proper and adequate methods of distributing it are planned for well in advance of the anticipated demand.

One important phase of a project to provide for the expected demand for water is now nearing completion in the industrial tideflats area of Tacoma where most of its manufacturing plants are located and where almost unlimited and ideal sites for future industrial expansion are abundantly available. An 8,000-foot long, 36-inch diameter iron water pipeline is being laid in a straight line completely across the tideflats area and it is expected that this big line will take care of expanding industrial needs for several years to come.

Laying the Pipe Line

The Urban Plumbing Co. of Tacoma has the $188,000 contract for laying the new water line and was scheduled to complete the job late last year. Since the tideflats area is almost entirely filled-in land, built up by previous dredging and pumping operations, the whole area is composed of fine river silt and sand. This rendered digging of an 8-ft. deep ditch for the pipe line a comparatively easy job, except that the trench had to be made extra wide at the top to eliminate danger of cave-ins of the soft sand.

Continual seepage of water into the trench from tide-water sources necessitated around - the - clock pumping operations in order that the work could continue on schedule; but despite these precautions the job's completion was held up for six weeks because of difficulties encountered. Six Homelite gasoline driven water pumps were used in changing positions along the trench to keep it clear of water. These pumps were small model 23S-21 type portables, easily moved from one spot to another as required.

For digging the trench a Northwest dragline crane equipped with a ¾-yd. hoe bucket was employed, together with an Insley boom crane equipped with a ¾-yd. hoe bucket. Where the trench crossed beneath railroad spur tracks, a pile-driver was used to drive wooden piles deep into the sand for supporting wooden bulkheads for shoring up the rail tracks.

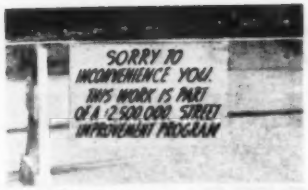
Since the trench paralleled both a secondary highway and a rail spur line for its entire distance, some difficulty and delay was experienced in maintaining normal traffic during working hours on the job. The 35-ft. lengths of steel pipe were handily brought in to the job on rail flat cars and unloaded by the cranes along the trench line.

Pipe was supplied by the American Pipe & Construction Co. of Portland, Ore. All pipe was tarred on the outside and wrapped with insulating fiber.

In order that welders could work on the job of welding the pipe joints together in the trench, carpenters on the site constructed square, rough wooden cribs, measuring 4 ft. by 5 ft. by 21 ins. deep, which were positioned deep in the bottom of the trench with each pipe end resting on half of a crib. After the pipes were carefully positioned in place in the trench by a crane, welders joined the lengths together, both inside and outside. Hobart, Lincoln and General Electric welding equipment was employed for this work, with the welders starting work at 6 AM in order to get through by 2 PM when the summer afternoon heat made working inside

(Continued on page 79)

● ***PIPE in place: Tarring and welding operations under way.***



● ***PUBLIC relations at work.***

How a Big Engineering

HENRY CHARLES SUTER

A newspaper reporter describes a street paving program.

SINCE Daytona Beach, Fla., has spent $4,250,000 on new sewerage facilities, it has been found necessary to initiate a $2 250,000 paving program. While paving our approximately 73 miles of roads takes a lot of asphalt, cement and sand for the paving, it takes a lot of paper, too. In fact, if it weren't for the paper, the streets would probably never be built and paved. Thus to design this extensive street paving project, Gannett Fleming Corddry and Carpenter, Inc., the engineers, drew up more than 100 pages of detailed plans. But that's not all.

There were 68 pages of specifications, and 33 pages and four detailed drawings by way of maps in a preliminary report. Now, as construction gets started, draftsmen are continually preparing supplementary detail drawings as problems arise in the field.

This street paving project will be the engineers' little red wagon until the last bit of asphalt is rolled out, the job inspected and found satisfactory and the last payment made to the contractor.

During construction, the engineers inspect each phase of the work, supervise the job and run tests on the material which will provide Daytona Beach with its first set of new streets in a quarter of a century.

For designing the project the engineers receive around $74,000. In addition they will be paid actual cost plus 50% for inspecting and supervising construction.

How Streets Are Built

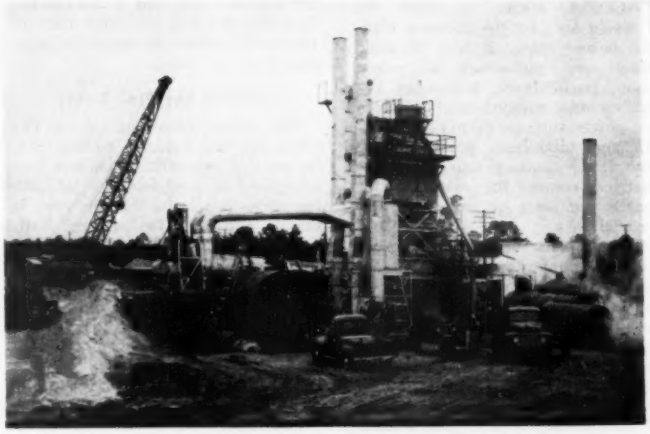
How do you go about building streets? Donald Carpenter, an officer in the engineering firm, and Charles Zwally, resident engineer, took turns in explaining just how it works. Zwally was the only employe of the Harrisburg, Pa., engineering firm sent here to design the street paving. Draftsmen and inspectors were hired locally.

"We send survey parties out over the City," Zwally stated. "They take field notes to determine center lines and grade. That isn't as easy as it sounds. Through usage some streets here actually 'moved over' a few feet. We determined the actual center line according to City property maps."

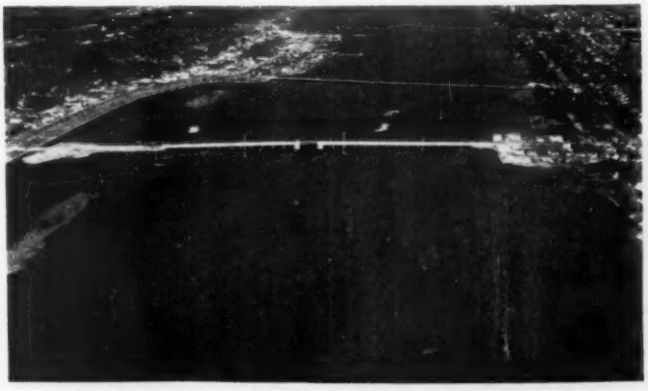
Field notes are compiled in the office and translated into working drawings on the draftsmen's tables. Grades are determined; curbs, gutters and sidewalks are plotted in. So are storm sewers, catch basins, man holes and other utility projections which must be reckoned with in building a street.

During the initial phase of the project here the engineers employed 10 draftsmen who worked daily and often nightly for more than four months to prepare the initial working drawings. Problems arise. One of the big ones on this project was the location and depth of gas, water, telephone and old sewer lines. City and private utility records were incomplete. Now the City will know exactly where every underground line lies and how deep it is.

Once the lines were located, they presented another problem, Car-



● ***ONE of the two hot-mix plants of the Cobb Construction Co.***



● ***NEW Broadway bridge, a project recently completed.***

Firm Handles a Paving Program

● ***FIRST batch of asphaltic concrete pavement is laid, starting the paving program.***

penter explained. "Up North the utility lines are buried four or more feet to give them protection against freezing. Down here you don't have that problem. Lines don't have to be set so low.

"So, on those streets which we are regrading, or where we are actually building new streets, the lines must be lowered so they won't interfere with the grade."

Adequate Drainage in Flat Areas

The biggest problem the engineers faced was in the soil and the topography. "You are so flat here that it's hard to get grade for your storm drainage. The soil, too, isn't very strong. It requires stabilizing with marl or clay or similar material to bring it to a sufficient bearing quality. I think you could say that a street is no stronger than its subgrade. But the sandy soil has some advantages, since it absorbs water rapidly and easily, so that your storm sewers don't have to be so big. If you had clay soil your drainage problem would be much worse," said the engineers.

To provide themselves with a double check on design and construction matters, the engineers call in consulting engineers, just like the family doctor will call in other specialists. H. S. Mattimore, retired chief testing engineer of the Pennsylvania State Highway Dept., is consultant for Gannett Fleming Corddry and Carpenter, Inc. On this job, Mattimore has checked over the plans already and will return here again to inspect the engineers' asphalt testing laboratory. This will be set up at the site of the contractors' asphalt plant in Holly Hill. Here, the engineers will test each batch of asphalt to see that the material content and stability of the mixture meets specifications.

Besides the consultant, top bracket officials of the engineering firm, such as Carpenter, make frequent visits here to check on the progress of the work.

"Our most important job now," Carpenter said, "is to see that the contractors do the work as specified. We have 12 inspectors in the field now and as more work gets started we will have more inspectors."

Each phase of the work is checked, Carpenter explained, and inspectors keep diaries of what goes on. Daily progress sheets are prepared in the engineer's office from this data so engineers can tell whether the contractors are ahead or behind the work schedule and how much material goes into the job each day. The contractors are paid monthly on the basis of satisfactory work completed.

The working plans are supplemented in the field by wooden stakes which carry notations giving center line and grade at specific points along the streets. About 30,000 of these stakes have been or will be driven along the streets by the engineers before the project ends. And thereby hangs a tale.

"Those stakes are pretty important," Carpenter declared. "They are accurately placed so that the contractors can tell how to determine the center line of the street and how to build the grade. You'd be surprised how many school children or grownups will come along and pull them up or give them a kick just for the fun of it. We sure wish people would leave them alone."

Bases and Surfacings

Bay and Palmetto, two heavily traveled arteries which are being widened, will have concrete bases, but most other new streets will have soil-cement bases. These are constructed by adding and mixing in predetermined quantities of cement to the existing soil. Soon the engineers will begin running tests to learn just how much cement must be added to provide a stable base. Because soil conditions vary even on the length of one street, Carpenter explained, the cement content can change several times within a block or two.

When the prepaving work got under way on Bay St., a crew from the contractors, Brinson, Cone and Manly Co., had to remove trees along the right of way while telephone and power company linemen moved utility poles back to the sidewalk to permit the street to be widened and paved to an 80-foot width. Work was also to be started on the Peninsula with installation of

(*Continued on page* 63)

Prefabricated Tile Media for

HUGH C. LEIBEE and RANDOLPH L. SMITH,
Consulting Sanitary Engineers
St. Paul, Minn.

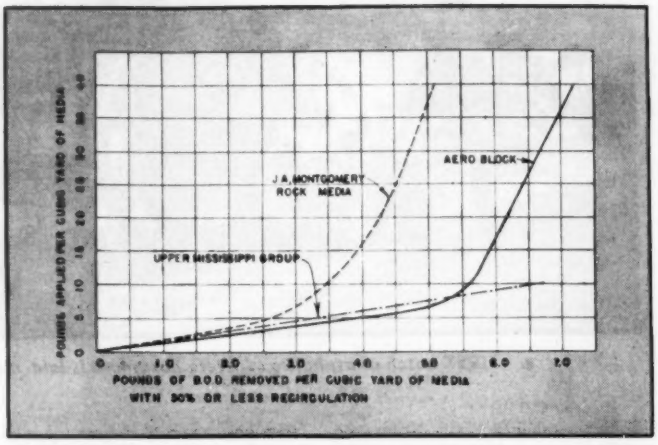
FOLLOWING the construction by Denton, in 1871, of the first biological filter for the treatment of sewage, filter media developed from earth, through fine sand, coarse sand, cinders, small rock and large rock with a sizing of one to three inches. The development, over the past twenty years, of higher daily application rates of sewage to filters has resulted in increasing the size of rock to a maximum of 4 ins.

Dr. Henrici, the late head of the Department of Bacteriology at the University of Minnesota, in his study of stalk bacteria, found a logical explanation for the physical functioning of the filter flora. The active microbial life is aerobic, the bacteria being attached to the filter media by "stalks", the head of the stalk being the active part of the stalk bacteria. The growth of these bacteria in large numbers creates a dense microbial "forest" that eventually prevents air from reaching the media surface and produces a condition wherein anaerobic liquifaction can dissolve the attaching element of the bacteria and cause the flora to slough. This sloughing is evidenced by the typical large particles visible in the filter effluent during unloading periods.

The filter flora appears to have certain characteristics that should be considered as important in the choice of a filter media. An active flora must be maintained in an aerobic condition; the flora must receive food continuously or nearly continuously: the flora can become up to one quarter of an inch thick, implying that the flora can plug a gap of less than one-half inch; the film thickness of the sewage applied at the top of the filter should be maintained down through the filter.

Using Rock Media

In the case of rock media, sewage applied at the top of the filter bed may tend to draw together and create a few large channels, thus eliminating a large volume of the bed from use. The "effective" surface in a rock media filter must exclude that part of the rock media where the surfaces are less than one-half inch apart; the underside of rock; that part of the rock surface where the velocity of sewage flow is so low as to prevent scouring and release of the filter slough; and that part of the media where channeling prevents the sewage from reaching the media. Rock media is used primarily because of cost. The most desirable rock would be perfectly round rocks of uniform diameter.



● ***REMOVAL of BOD by rock and tile on basis of applied load.***

It is, of course, impractical to get rock of that kind. The more customary rock media is crushed rock. Care must be taken that there is not an excessive number of flat pieces which must be removed by hand. Commercial rock media is rarely of the right size and screening by hand at the plant site is a normal requirement if satisfactory sizing is to be obtained. Rock media will provide between 9 and 12 square feet of surface per cubic foot of media with 25% to 50% voids. During a recent construction job, trap rock, screened at the quarry was hauled twenty miles, hand picked for flats and hand screened at the site. The net cost was $12 per cubic yard, without profit, in place in the filter. A good quality rock is a necessity for a well performing filter and it is not inexpensive.

A. A. Page of the Red Wing Sewer Pipe Corporation of Red Wing, Minnesota, about 1933, started research work in an effort to develop a media of hard-burned clay as a substitute for rock. The original conception was to make 2-inch diameter round balls. Because of the extremely high labor cost of making the balls, it was quickly realized that any commercially workable prefabricated media must be based upon the extrusion process. A die was prepared and eventually developed into the unit used today. The clay is de-aired and then forced through the die under heavy pressure, cut to the desired length, dried and then kiln burned.

Installations of tile media have been made almost continuously since the early development period but have been limited to the states of Minnesota, Wisconsin and Illinois because of the death of Mr. Page during the development period and the failure of the estate to carry on with promotional activity. Today other companies are prepared to deliver tile media.

Tile media provides 20 to 22 square feet of surface per cubic foot of media. The physical structure is similar to a huge swiss cheese, consisting of one-inch diameter round holes extending vertically from top to bottom of the filter, separated by ¼-inch walls. The tile must be hard-burned. The tile is made in 12-inch

BIOLOGICAL FILTERS

lengths and dowelled into position to maintain the vertical alinement. The sections are not cemented into position. The under-floor is constructed of concrete so as to maintain a level, uniform surface; a tile support for the media is placed directly on top of the concrete floor.

The use of one-inch diameter vertical holes provides certain basic requirements that must be met. It is obvious that the more customary low capacity distributor might flood the holes and produce a low efficiency. The distribution must be of the rain-drop type, as used with the Aero-filter, with the drops contacting the walls of the vertical holes at an angle. The vertical holes prevent channeling, maintain the same film thickness from top to bottom of the filter and produce a condition approaching the maximum amount of "effective" surface for microbial growth. The vertical walls, with a maintained thin film of liquid, produces the best aeration conditions; the best scouring condition for removal of sloughed flora; the elimination of sludge pockets where anaerobic digestion can occur with consequent odor; a sufficient gap between surfaces to prevent ponding; a uniform media; and a permanent material.

The graph shows three performance curves: (1) for rock media as established by Dr. Montgomery; (2) the tile media performance as established by tests; and, (3) the performance curve as set up by the Upper Mississippi Group.

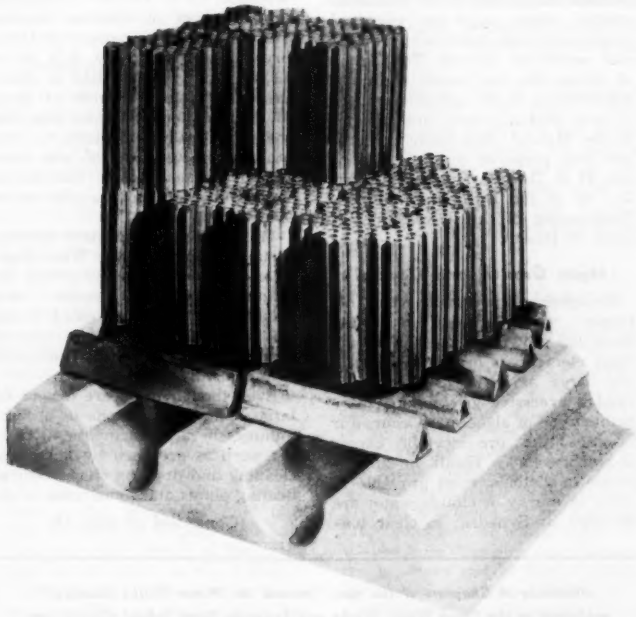
Performance and Loading

The standards of the various states, with the exception of the Upper Mississippi Group, provide for maximum loadings of between 1.5 and 2.0 pounds of BOD per cubic yard of rock media. The manufacturers of Aero-filter equipment recommend maximum loadings of 2.0 pounds of BOD per cubic yard of rock media for high capacity filters. It is customary to design tile media filters on the basis of 3.0 to 3.33 pounds of BOD per cubic yard of media. This is in accordance with the design data set up in the Upper Mississippi River report. At the time of the conclusion of the original research work on tile media, Dr. H. O. Halvorson, who acted as advisor to Mr. Page, set a maximum design loading of 1.0 pound of BOD per square foot of filter surface (4.5 lbs. of BOD/cy) for tile media. During the period of consultation with the various state officials at the time of the summation of the Walton data, this was changed to 0.75 lbs./sq. ft., or 3.33 pounds of BOD per cubic yard.

Tile media is designed to treat strong wastes, the percent of removal will remain constant up to a ppm BOD of 550; the permissible high loadings per cubic yard of media will result in a material reduction in total plant cost; the media is ideal for anaerobic wastes or wastes having a high suspended or settleable solid content. Table I shows records of operation at several plants using tile media. Most of these results are from the first stage of double filtration, with consequent short-term final settling tanks.

TABLE 1.—Operation Records for Tile Media Plants

Location	No. of Tests	Tests By:	Recir.	Removal %
River Falls, Wisc.	Daily for 1 Yr.	H. O. Halvorson	None	86.8
Owatonna, Minn.	16 in 1946	City	None	85.4
Detroit Lakes, Minn.	3 in 1944	U.S.P.H.S	30%	87.5
Ladysmith, Wisc.	1 in 1950	St. of Wisc.	30%	84.9
Clear Lake, Wisc.	"	"	4 passes	97.4
Kenyon, Minn.	2 in 1951	St. of Minn.	2 passes	83.5



● ***THIS is what tile media looks like. Surface area per cubic yard is 20 to 22 sq. ft., about twice that of rock media.***

HELPFUL SUGGESTIONS FOR OPERATING WATER WORKS

DISASTERS and emergencies are unpredictable; general advance planning is necessary. It must be remembered that when disaster strikes, confusion is sure to be present, and the community is burdened further by the influx of sightseers, friends and the curious.

Floods, hurricanes, explosions, earthquakes, ice storms and fires may destroy homes and buildings, break water mains and service lines, damage water storage facilities, destroy communication lines and cause contamination of the supply and the distribution system.

Training the Staff

It is essential that the plan, as developed, be put down on paper and the employees fully instructed as to their respective parts under the plan. Other essential factors include a clear designation of who is in charge, and the location of the headquarters, which should be accessible and large enough for all necessary activities, including equipment storage. After an emergency occurs, the man in charge should establish himself in this headquarters just as soon as he has made a quick survey of field conditions. The job to be done by the man in charge is primarily one of administration and co-ordination—not of personal participation in the details of the work. A responsible and capable director should be at headquarters all of the time.

Water department employees and their families are as likely as anyone else to be injured or killed if disaster strikes. Therefore the entire staff should be familiar with all of the plan and substitutes must be ready to take over all key jobs. Outside assistance may be needed, as water and health department personnel from adjacent cities; State Sanitary Engineering division employees; representatives of water works equipment manufacturers; plumbers; and pipe fitters. Plans should be made for incorporating these skills properly into the program.

Seldom, if ever, will a community have all of the equipment necessary to meet its needs during disaster. Especially important is a census to determine where pumps, motors and standby power units can be loaned, rented or purchased; also repair and replacement parts for the distribution system, such as fittings, valves, sleeves and couplings; and standby chlorinating equipment, including portable units.

Transportation and communications are highly important. Local facilities may be ample for the first; and, if the city has 2-way radio, the communication problem may be eased considerably, especially with the help of the county and the state highway patrol systems, plus perhaps "ham" operators.

Emergency water supply may be necessary. This is a service not needed in normal times. Therefore special plans must be prepared, equipment and materials provided and personnel trained. The details of doing this, and much additional information on the subjects touched on only sketchily here, are included in the Manual. This particular section was prepared by J. L. Robinson, D. B. Davison and R. S. Griffin, Jr., all of the Bureau of Sanitary Engineering of the Texas Department of Health.

Algae Growth and Control

Phosphorus, potassium and nitrogen, when present in water, favor the growth of algae. If one of these elements is present in unusually large amounts, a "bloom" or sudden excessive growth of a particular type of algae may occur. For instance, the presence of excess phosphorus may result in an increase in diatoms; most probable to occur in murky or cloudy water are Melosira or Synedra; in clear water, Tabellaria, Fragilaria or Asterionella are likely. Nitrogen in a lake having a relatively high calcium content is apt to develop a dense growth of Anabaena and some Oscillatoria.

The very complete chapter on algae in water supplies was prepared by Dr. J. K. G. Silvey and B. B. Harris of the North Texas State College. In the section on control of algae, a table is presented showing the chemical dosages required to control algae. In addition to the copper sulphate requirements normally shown, the chlorine and chlorine dioxide requirements for many forms of algae are added. For instance, control of Synedra requires 0.36 to 0.50 ppm of copper sulphate, 3.0 to 4.2 ppm of chlorine, and 0.7 ppm of chlorine dioxide. Anabaena requires 0.12 to 0.48 ppm copper sulphate, 1.0 to 4.0 ppm of chlorine and 1.2 ppm of chlorine dioxide. The control requirements of Dinobryon are, respectively, 0.18, 0.3 to 1.0, and 1.5 ppm. The data on chlorine and chlorine dioxide as given in this chapter, are more complete than are readily available in any other place we know of, and there is much other useful information in this chapter which could not be summarized here.

More and more industries demand certain qualities in their Water Supplies. The quality requirements for industrial water supplies vary greatly—from an untreated water for cooling to one of a quality higher than that usually provided for domestic use.

Even though there are few or no large boiler installations in a community, there are many small boilers, such as are used by laundries, cleaning and pressing shops, central heating plants and some types of air

(*Continued on page 74*)

Abstracts of Chapters of the new "Manual for Water Works Operators", published by the Texas Water Works and Sewerage Short School. Copies can be ordered through Texas State Health Department, Austin, Tex.

HIGH SPEED LAYING of 78-inch pipe

Photos courtesy Caterpillar

● ***TRACTOR with bulldozer and ripper, work alongside dragline on pipe laying.***

● ***DIGGER preparing trench for 78-inch reinforced concrete pipe which has been placed in cradle at left.***

IN the construction of 8½ miles of auxiliary line for the San Francisco, Calif., Water Department, special equipment and unusual methods were used which permitted laying as much as 500 ft. of pipe in an 8-hour day. The pipe was of reinforced concrete, 93 inches outside diameter; the sections were 18 ft. long and weighed approximately 20 tons each.

Trenching and Laying Pipe

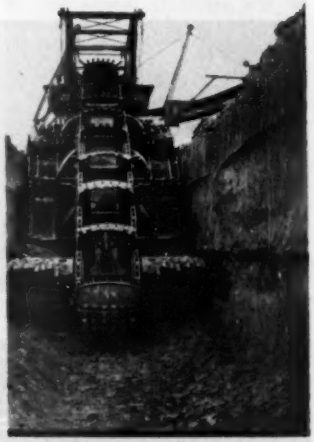
A trench 10 ft. wide and 11 ft. deep was required and this was dug with a special trencher, powered with a Caterpillar diesel engine, which cut the entire section in one operation. Spoil was deposited alongside the trench. A motor grader worked ahead of the trencher, constructing two temporary roads. One of these was for the trencher to travel on while digging; the other, on the opposite of the trench line from the spoil bank location, was for the use of the tractor-trailer combinations used to haul the pipe. As much as 350 ft. of trench was dug per day.

Still another job done by this motor grader was the construction of an earth cradle in which the pipe was placed while waiting laying. This cradle prevented the pipe from rolling out of place and kept it in convenient reach of the crane used for placing it in the trench.

For laying the pipe, a crane powered by a Murphy diesel engine was used. This lifted the pipe from the cradle and placed it in the trench for jointing. Backfilling was by a Lima dragline and two Caterpillar tractors; both of these were equipped with bulldozers for backfilling; and one of them also with a ripper. This was used in rough going ahead of the trencher to break up solid formations. The tractors were, at times, used to help move the pipe-laying crane.

Other Work on Project

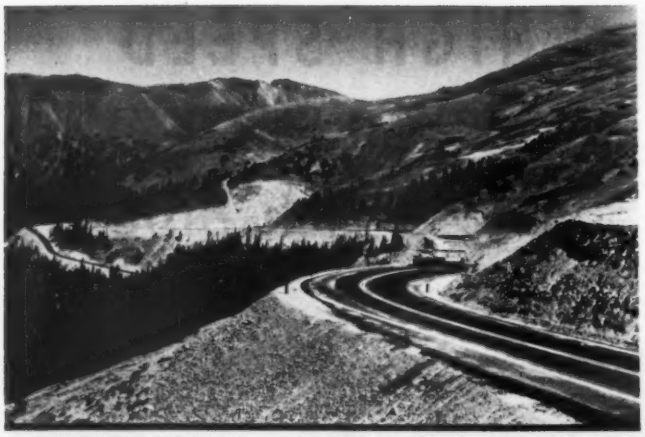
The work was done by the United Concrete Pipe Corporation. The illustrations show work near the Mission San Jose. The auxiliary line extends from the Irvington Portal of the Coast Range Tunnel of the Hetch Hetchy aqueduct to the Pulvas tunnel near Redwood City. In all 34 miles of pipe line will be built. This work is being carried on under three contracts, of which one is described here. The new line will skirt the southern end of San Francisco Bay, whereas, existing lines rest on a submarine trestle at the bottom of the bay. In event of damage to these submarine lines, the auxiliary line will supply the city.



● ***DIGS trench 10' wide and 11' deep at 350 ft. per day.***

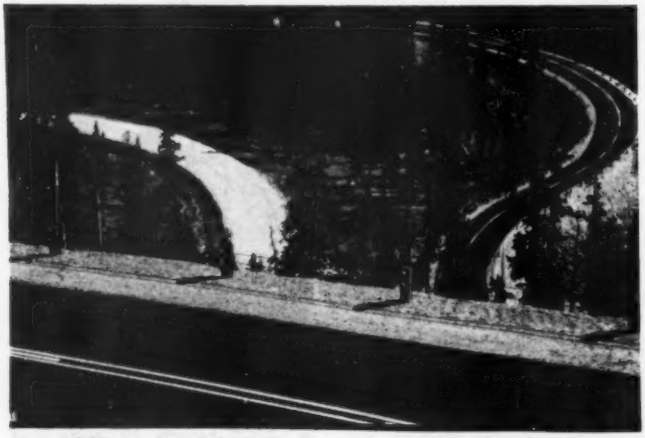
Colorado

J. M. ARMSTRONG



● *WIDENED paved highway, showing double lane in foreground.*

● *DESIGN for expressway travel; one single and one double lane.*



● *OLD road on left contrasted with the wider paved highway.*

A YEAR and a half ago the Governor of Colorado appointed a nineteen-man committee, headed by State Senator Stephen L. R. McNichols, to investigate highway conditions throughout Colorado and to recommend remedial action. After intensive research and mile-by-mile surveys, the following startling facts were revealed:

Of the 79,695-mile state highway system, 27,075 miles need complete new construction or reconstruction and 13,161 miles need major repairs. Also, 29,494 miles of road should be dropped by counties and cities, since they are hardly ever used and are merely draining the various departments of time, money and machines.

In addition to the bad condition of the roads, 2,665 bridges and other structures require construction or widening and major repairs. Not only that, 9,964 miles of the state's highways now considered tolerable will wear out or be outmoded in the next twenty years.

In other words, the entire remaining 50,200 miles of Colorado's highway system must have a new face during the next twenty years.

How the committee proposes that the state do this tremendous task was set forth in its 250-page report. The cost of the program will be one and one-half billion dollars. Broken down annually, this amount will almost double the state's present outlay for highway maintenance and construction.

Standardizing Construction

As proposed by the committee, the increased cost will have to be borne by autoists and commercial motor carriers in heightened taxes and fees. Highway revenue distribution will be altered. And considered as essential for the success of the plan is standardization of all road construction.

Using statistics obtained from other states, as well as on-the-spot surveys made under the direction of Prof. Roderick Downing, Head of Civil Engineering at the University of Colorado, and Robert E. Livingston, Planning and Research Engineer for the Colorado State

Standardizes Road Surfaces

Highway Department, the committee determined the classes of highways required by the state.

According to the amount and load of traffic using each road, standards of construction for all streets and highways in the state were set up. These include shoulder width, roadbed width, design speed, grade, right-of-way width, access control, bridge design load, width of bridges and separations. Under the plan, each location in the state will have, in twenty years, highways and streets equal to those of any other location in the state which has similar traffic conditions.

For instance, all highways handling 5,000 to 15,000 vehicles daily will have not less than four lanes at least twelve feet wide built of portland cement concrete, asphaltic concrete, or equal, over any type of terrain. All roads serving from 1,600 to 5,000 vehicles daily will have two lanes twelve feet wide, built of the same asphaltic or concrete mixture, over any type of terrain.

Five Standard Surfaces

Construction specifications include the five highway surface classifications of high, high medium, medium, low medium, and low. High surfaces will be built of portland cement concrete, asphaltic concrete, or equal; high medium surfaces of plant mix mats (2″ plus); medium surfaces of plant mix or road mix mats (2″ plus); low medium of surface treatments and light road mix mats (2″ minus); while low surfaces will be finished with natural gravel, sand clay, gravel or rock.

High surfaces will be constructed for rural state highways serving from 1,600 to 15,000 vehicles daily and for city streets which are used for state highway connecting links, business streets, main thoroughfares, and local service streets in areas of high population density.

High medium surfaces will be used for rural state highways serving from 800 to 2,000 vehicles daily and for county primary roads serving over 1,000 vehicles daily.

Medium surfaces will be built for rural state highways serving from 400 to 1,000 vehicles daily, for county primary roads carrying the same load, and for local service city streets in areas of medium population density.

Low medium surfaces will be used for rural state highways having an average daily traffic of 100 to 600 vehicles, for county primary roads used by 100 to 600 vehicles, and for county land service roads carrying 100 vehicles daily. Low surfaces will be utilized for rural state highways used by less than 200 vehicles daily, for county primary and land service roads used by less than 100 vehicles daily, and for city local service streets in areas of low population density.

When comparative estimates indicate that a higher surface type can be constructed for a cost approaching that of a lower type, the higher type will be used. Limitations on vehicle design and load will be imposed to prevent undue stress on bridges and surfaces.

These specifications have been set up not only for current traffic requirements, but also for those in the future which may be more demand-

● ***ERODED primary road surface and narrow bridge directly around blind corner are typical of old conditions now being replaced.***

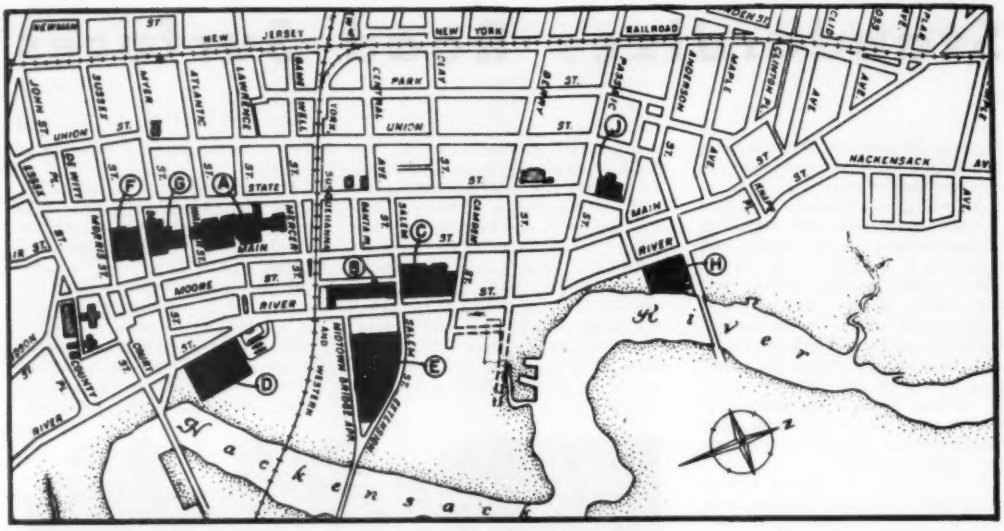
Bridges and separations will be designed to carry loads ranging from a ten-ton truck followed by smaller vehicles to a twenty-ton truck pulling a sixteen-ton trailer and followed by smaller trucks and vehicles. For city streets used as state highway connecting links and rural state highways used by more than 1,600 vehicles daily bridges designed for twenty-ton trucks pulling sixteen-ton trailers will be constructed. Rural state highways serving 800 to 2,000 vehicles daily and county primary roads carrying more than 1,000 vehicles daily will have bridges designed to support a fifteen-ton truck pulling a twelve-ton trailer.

For city business streets and main thoroughfares, rural state highways serving under 1,000 vehicles daily, all other county primary roads, and land service roads carrying over 50 vehicles daily, bridges designed to support a fifteen-ton truck will be used. For land service roads serving less than twenty-five vehicles daily and all local service streets in cities, bridges designed to carry a ten-ton truck are considered sufficient.

ing because of unusual vehicle design and heavier traffic conditions. Trends of population shifts and resultant change of traffic loads are considered. The program is set up so that annual decisions will be made concerning construction or major repairs.

When completed, this long-range, pay-as-you-go highway program will have equipped the state (including municipal, county and state systems) with:

386 miles of expressway surfaces, as compared with 43 miles at present; 2,199 miles of high surfaces, as compared with 789 miles at present; 1,540 miles of high medium surfaces, as compared with 0.2 miles at present; 4,291 miles of medium surfaces, as compared with 6,669 miles at present; 4,565 miles of low medium surfaces, as compared with 495 miles at present; and 37,218 miles of low surfaces, as compared with 14,733 miles at present. It is intended that there will be no unimproved, graded or drained surfaces, of which there is a total of 27,477 miles at present.



How Hackensack Solved its PARKING PROBLEMS

SEYMOUR F. MALKIN

THE City of Hackensack, N. J., has set a precedent for New Jersey, at least, by undertaking a large-scale parking program at a time when the shopping district faced traffic strangulation. The 2-million dollar, 2-year program calls for interior parking lots, removal of more than 60 houses, and improvement of existing City lots to make possible the parking of 2,905 automobiles adjacent to Main Street, in addition to the 10,100 that can now be parked.

The program will be self-amortizing over a period of 40 years. Officials say the program will not affect the City's tax rate in any way and should inspire vast new commercial development for Hackensack.

The Hackensack Parking Authority was appointed more than a year ago by Mayor A. R. Granito. The Parking Authority, headed by Emil J. Habrich, retained the engineering firm of Parsons, Brinckerhoff, Hall & Macdonald, of 51 Broadway, New York City; and the law services of Dominick Fondo of Hackensack.

The engineering report, which was filed in September of 1950, provided the basis for action taken in January when the City Council and the Parking Authority proceeded with the leasing arrangements, to be followed by the bond issue.

In that report were factual data to substantiate findings and the recommendations as to number and location of parking facilities needed to satisfy City needs, their cost, and the income to be derived from their operation by the Hackensack Parking Authority. In addition there was a summary of the financial aspects of the program.

Data relating to the demand for parking spaces in the affected area was based for the most part on surveys conducted in the City. The information was supplemented with a comprehensive inventory of all curb and off-street parking facilities in the project area.

The information obtained from the Origin and Destination Postal Card Surveys indicated the amount, type, and duration of parking desired and the location where motorists wanted to park within the City. A summary of this data represented the total parking demand for the City. Field surveys conducted showed an inventory of curb and off-street parking space and indicated capacities, turnover, rates charged, and location of existing parking facilities. By subtracting the number of the available spaces from actual demand, it was shown that a deficiency of parking spaces exists in Hackensack. This deficiency is the number of spaces, beyond those already existing, needed to satisfy the City's parking requirements.

Locating Parking Lot Sites

A survey then was conducted to locate sites in the area close to where parking deficits exist. Many possible sites were examined during this phase of the work.

Some of those sites were discarded because of excessive land acquisition costs. Others were rejected because of location characteristics. The real estate costs for the selected sites were obtained from the City Assessor's office and are a modification of the assessed values, factored to arrive at a present-day fair market value. Using the minimum space requirements, capacity figures were found for each of the parking sites and preliminary layouts of space and estimates of the cost of constructing these lots were made.

A total of nine locations was selected as the sites for the parking facilities. These lots were located as indicated above.

(*Continued on page* 78)

Four Years of FLY CONTROL *at the Illinois State Fair*

C. W. KLASSEN, and J. D. WILLIAMS,
Chief Sanitary Engineer and Principal Sanitary Engineer
Illinois Department of Public Health

DURING the four-year period, 1947 through 1950, fly control has been effected in spite of tremendous fly-producing conditions at the Illinois State Fair, Springfield, Illinois. The solution of the numerous fly-control problems we have encountered provides clues for the solution of many community fly-control problems.

For fifteen to twenty years prior to 1947, the Illinois State Fair was noted for its flies. Food stands were badly infested, picknickers had their lunches covered with flies, and even livestock were seriously affected. Each year after the Fair, nearby residents were annoyed by flies originating from fly-producing materials left on the fairgrounds. When the decision to control flies was made in 1947, considerable interest was aroused not only in Springfield but throughout the State.

Conditions at the Fair Grounds

An aerial view (on page 45) of the one-half square mile fairgrounds, is taken with the camera pointed north, and shows the fairground boundaries marked with a solid white line. The grounds extend about 600 feet farther west to include a Fair-time tent encampment of several thousand persons. Immediately beyond the west edge is the Springfield city dump and a private dumping grounds that receive garbage and refuse from approximately 60,000 persons. On the north, immediately across the road, is a livestock auction barn with holding pens, a turkey ranch with capacity for several thousand fowls, a farm, and a small slaughterhouse; to the northeast is a large slaughterhouse with holding pens and tankage-producing facilities. Each of these potential fly-producing areas is indicated on the aerial view. The south and east adjacent area is middle-class residential.

Inside the fairgrounds, the following items have entered into fly-control problems: (a) railroad siding and unloading dock on east side of the grounds; (b) the numerous scattered parking areas; and (c) junior livestock building on west side of grounds.

Fundamental Considerations

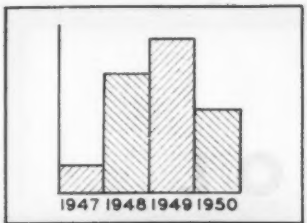
Since flies need approximately ten days to develop from egg to adult, flies originating from manure deposited by livestock on the grounds cannot be important during Fair-time, a ten-day period. Flies must migrate from surrounding areas or be carried to the grounds as adults, larvae, pupae, or eggs.

Fly populations vary tremendously from year to year and, therefore, flies may not reach a sufficient density at adjacent fly-breeding areas to migrate during certain years. Also, fly-breeding materials, in which immature stages of the fly could be transported to the Fair, may not be equally infested each year.

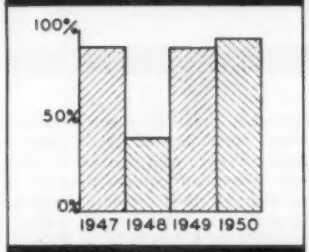
In the period considered, the Fair has been held during the middle of August. This is a period during which fly populations are usually increasing rapidly in Illinois.

The program evolved along the following lines: The year 1947 was a poor fly year and DDT applied as a residual to selected fly-resting places gave very good fly control. Entomological controls were not maintained. The next year, 1948, was a good fly year. DDT residuals applied to the same places and by the same methods as used in 1947 were not adequate. For that reason, residuals were supplemented by complete daily coverage with thermal aerosols and pyrethrum sprays applied as needed at food stands. Benzene hexachloride was used experimentally as a larvicide on fly-producing areas in trucks and railroad cars. Chlordane residuals were experimented with to some extent. Entomological controls were maintained by daily fly collections at six stations. Fly ribbons and pyrethrum sprays were used for fly collection but were not found satisfactory.

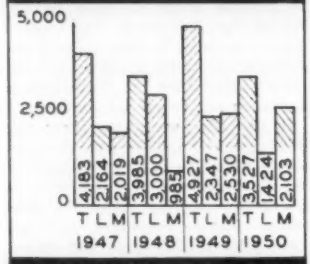
In 1949, flies were very prevalent. DDT residuals applied several weeks before Fair-time did not adequately reduce the flies migrating from adjacent fly-breeding areas. For that reason, lindane residuals were applied prior to Fair-time and chlordane larvicides were applied to fly-breeding materials adjacent to the fairgrounds to reduce fly populations to the point where they could be handled by lindane residuals. Plans were made to eliminate fly production in trucks and railroad cars by sanitary control but these plans were not enforceable. For that reason, chlordane larvicides were used as soon as livestock had been unloaded from any of these vehicles. Fly control was excellent. Some pyrethrum sprays were used and a mist blower was available for use against adult flies. Surveys found special fly-breeding areas which were promptly cleaned up, larvicided, and treated with residual sprays. Fly elimination was possible provided the larvae source was found. Control was excellent as illustrated by counts at 17 fly-counting stations. The Public Health Service Scudder grill was used for counting flies where they were sufficiently numerous to make this method practical. Area counts were made at all stations, as were station counts.



● YEARLY variation in fly production.



● MEASURES of control effectiveness.



● TOTAL, labor and material costs for each year's program.

The past year, 1950, was a near average fly-production year. Lindane was used as a residual spray. Orthodichlorobenzene and chlordane were used as larvicides. Better sanitary control was maintained of livestock trucks and railroad cars and the city dump was converted to a sanitary landfill. Control was excellent. Entomological control was maintained by grill counts, area counts, and station counts at similar stations to those used in 1949.

Residual Treatment

DDT was applied at a 200-milligram per sq. ft. rate with nozzles giving a fan-shaped spray; 40 pounds per square inch pressure was used. Except for buildings having fly-trap areas, walls and ceilings higher than 12 feet were not treated. Emulsifiable concentrate was used for the most part, although 50% wettable powder was used in some locations where the white deposit was not objectionable. Treatments started approximately one month before the Fair opened. Hand sprayers were used to considerable extent in 1947 but a switch was made to power equipment in 1948.

Lindane was applied at a 25-milligram per sq. ft. rate; treatment was started 10 days before the Fair opened to permit not over a three week life for lindane residuals. In 1950, the power sprayer used was equipped with orchard spray nozzles rather than nozzles giving fan-shaped spray. This change was not considered advantageous but apparently did not jeopardize the program in any way.

Larviciding

In 1947, larvicides were not used, but in 1948, benzene hexachloride was used experimentally. A switch was made to chlordane in 1949 and it was used extensively at a concentration of one quart 40% emulsifiable concentrate to twenty-five gallons of water. The sprayer in which chlordane was used developed pressures of approximately 300 pounds per square inch and was equipped with orchard spray nozzles delivering a solid stream. Fly-breeding material was saturated with the chlordane spray. Livestock trucks, turkey ranch, high fly-producing areas, and the city dump were treated. In 1950, orthodichlorobenzene in emulsifiable form, used in the same places, gave good results. In incidental investigations it was found that paradichlorobenzene crystals suspended in closed garbage cans killed fly larvae. Fly breeding in garbage cans was not a problem at the Fair, but this information has led to increased use of paradichlorobenzene and other fumigants in garbage cans.

Adulticiding

In 1948, it was necessary to make a thermal aerosol generator during the first few days of the Fair to assist control. This was made on an International pickup truck. It operated satisfactorily and demonstrated on numerous occasions that the thermal fog was lethal to flies and mosquitoes. It was necessary that the entire grounds be fogged daily to give the desired degree of fly control. A formula consisting of one-third 25% DDT in xylene, one-third diesel fuel and one-third used crank-case oil were used. Experimental runs with activated pyrethrum gave good results in large barns but was considered too expensive for general use.

In 1949, a large mist blower was available and was used experimentally. It did not prove satisfactory for the air blast made it impractical to use around food stands and tents. Furthermore, the air blast seemed to drive flies under cover before the insecticide contacted them. Some small aerosol generators and mist blowers were used around food stands. Fortunately, this type of spraying was not needed to any great extent. When such control measures are needed, flies are too numerous for the degree of control needed at a Fair.

Costs of the Program

The cost of the program has been as follows: In 1947, $4,183; in 1948, $3,985; in 1949, $4,927 and in 1950, $3,527.

In spite of the increased cost of insecticides, the program actually cost less in 1950 than in any of the previous years. Entomological control work is primarily responsible for this for it has allowed treatment of selected areas. To some extent, the switch from hand equipment to power equipment helped. In looking to the future, it is believed that control by sanitary practices can reduce this figure considerably.

Fly resistance to insecticides was considered important in 1948 and 1949. Tests by the Illinois State Natural History Survey indicated that it was widespread in Illinois, but attempts to collect housefly larvae or eggs on the fairgrounds were not successful and for that reason specific test results are not available. Factors such as sanitation and proper insecticide application appear to be more important thus far for with proper attention to these factors, fly control can be obtained.

Entomological Control

Results from 17 fixed fly counting stations gave a good comparison of control effectiveness and provided the principal orientation for control. Fly counts were made every day and consisted of Scudder grill counts where the flies were sufficiently numerous; area counts of all flies seen from the point at which the grill count was made, and station counts on selected panels, boards, or building walls. These counts were of necessity supplemented by surveys to locate localized fly-breeding sources. Often a localized source occurred at sufficient distances from a fly-counting station so that the counting station did not reflect its importance. A comparison of the fly counts made in 1949 and 1950 indicates what is believed to be a true picture in

● ***LAYOUT of Fair Grounds, with location of facilities mentioned.***

those areas where fly populations were low. In areas of high fly density, the counts do not indicate the degree of infestation. In reviewing fly count data, it is necessary to compare the area and station counts, for quite often a more favorable station gives a higher fly count than is warranted, while area counts tend to indicate true conditions.

Fly surveys at night were helpful in locating preferred fly-resting places. This method was often used to orient residual insecticide applications. Fly collection with subsequent identification was not necessary for control work. Actually identifications are delayed and so much time is consumed in fly collection that control work suffers. Fly collections made in 1948 with fly ribbons reveal that ribbons are attractive to house flies only. Pyrethrum space sprays with subsequent collection of dead flies was not found practical in a busy area.

Fly larvae surveys are essential and are the only good way of orienting larvicide applications and sanitation measures.

Results and Conclusions

(1) Fly control at Fairs can be effected by coordinated entomological surveys and control measures. For example, railroad stock cars carrying immature, as well as adult flies, contributed many flies to a food-stand area of the fairgrounds before the source was discovered. By prompt application of larvicides, residual sprays, and insecticidal mists, the fly infestation was reduced to a very low level within 24 hours.

(2) Flies migrate from adjacent fly-breeding areas where fly population pressures are adequate.

(3) DDT or lindane residuals alone do not provide the desired degree of fly control during some fly seasons.

(4) Fly larvicides are valuable in reducing fly populations to a point where the effect of residuals can be noted. In addition, larvicides provide a chance to evaluate what can be done by sanitation. Trucks and railroad cars, which are the principal source of fly infestation during the Fair, can be controlled by larvicide applications, but eventually sanitary practices can be evolved which will be simpler and more economical than larviciding.

(5) Insecticidal fogs are a help in fly control but under the conditions studied provide a relatively small part of control. Thermal aerosols appeared to be better than mist applications, apparently because the air blast from the mist blower machine did not allow its use in food stand and tent areas and because the air blast drove the flies into areas where they were protected from the insecticide.

(6) If fly control after a Fair is to be practical, control measures during the Fair must be so good that flies are not available to lay eggs on the many potential fly-breeding materials.

(7) Night surveys are very helpful in determining the preferred fly-resting areas. Local surveys of this type are better than generalized information because they cancel the errors due to fly species and local variability in fly-resting places.

(8) Counts at particular locations often reveal preferred fly-resting areas which should be heavily treated with residual insecticides. For example, many fairground buildings have clerestories which act as fly traps. The buildings are open on the sides, the flies are attracted to the animals in the buildings during the day but in late afternoon leave and fly up into the

(*Continued on page* 76)

How Texas Controls

D. F. SMALLHORST,
Senior Engineer,
Texas State Department of Health

ACCORDING to the modern trend for classification of stream waters, Texas has only "Class A" streams. Therefore, the water pollution control program for the State of Texas, at this time, is primarily one of maintenance of existing water quality conditions, rather than extensive "clean-up" or river rehabilitation.

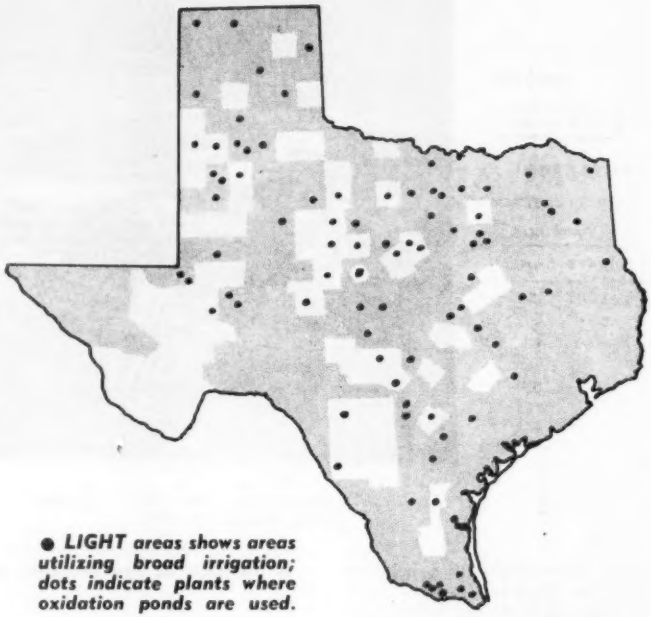
The Texas State Department of Health has been actively engaged in water pollution control activities for the past 36 years. The original stream pollution statute, as passed by the Legislature in 1913, provided for the appointment of an inspector to make necessary investigations, inspections, and reports, and perform other duties in respect to the enforcement of the law. This legislation served as a basis for our present pollution laws, which are Article 4444 of the Texas Civil Statutes, and Article 698b of the Texas Penal Code. These laws name the Texas State Health Department as the enforcement agency, except in those cases involving fish, marine, and aquatic life, and then the authority is vested in the Texas Game, Fish & Oyster Commission.

These laws have been interpreted to imply that all wastes shall be of such a nature as not to affect harmfully the quality of the receiving waters. It follows, then, that complete treatment facilities are indicated for any waste which reaches a watercourse of the State. It is upon this premise that the water pollution control program has been developed.

In carrying out this program over the years, an intensive educational program has proven highly effective, as is evidenced by the fact that this State has more sewerage systems than any other State in the Union, and that approximately 66% of the population of Texas is connected to a public sewerage system.

Texas Treatment Plants

A review of our files on January 1, 1951, disclosed that Texas has approximately 609 sewage treatment plants, of which about 445 are complete treatment plants, and 164 have primary treatment facilities only. There are 14 municipalities having collection systems but discharging raw sewage into nearby waters; however, at least 9 of these 14 cities are located on tidal waters, and of this number four are now planning treatment facilities.



● ***LIGHT areas shows areas utilizing broad irrigation; dots indicate plants where oxidation ponds are used.***

Most of the primary treatment plants are located in the arid areas of Texas where the effluent evaporates or seeps into the ground before reaching any water course, and consequently many of these installations present no pollution problem.

It is interesting to note that during the year 1950, 129 sewage treatment projects were completed or actually placed under construction. These plants were designed to serve a total population of 2,000,000 people and were constructed at a cost

● ***PORT Lavaca plant, Myers & Noyes, engineers, built in 1950***

WATER POLLUTION

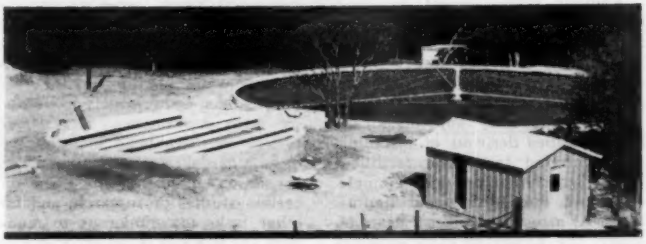
exceeding $12,000,000. These figures include both new sewage treatment plants and major additions to existing facilities.

Texas has led the Nation in the organization of Regional Water and Sewage Works Operators Associations. It has been through the organization of these Associations that sewage plant operators have received training and education concerning their profession, which has ultimately resulted in improving the maintenance and operation of sewage treatment facilities.

Training and Licensing Operators

For many years the water and sewage works operators participated in a voluntary "licensing" program sponsored by the Texas Water and Sewage Works Association, the Extension Service of Texas A. & M. College, and the Texas State Department of Health. This program established qualifications for certificates in three classes, A, B, and C, by weighing years of experience and attendance at annual or regional meetings. Upon the approval of the application by the Certification Committee, a written examination was given, and if a satisfactory grade was obtained the certificate was issued. In 1945, legislation made this program compulsory, and it is being continued as described above. To date, under this program, 22 A, 167 B, and 1,225 C certificates have been issued.

There are now 38 Regional Water and Sewage Works Associations in the State. These organizations meet once each month for a formal two-hour technical discussion. There is also a trend toward annual all-day meetings of several neighboring Associations, with attendance by 100 to 300 operators. These inter-regional meetings are mainly scheduled during the summer months, and generally a "Texas-style" barbecue with all the trimmings is a feature of the social aspect of the meeting. In February or March, the Annual Meeting of all the Associations is held at A. & M. College, College Station, Texas. Here, an intensive four or five-day program is presented. This annual meeting is usually attended by 400 to 600 operators, city officials, consulting engineers, Health Department engineers, and others. In addition to these meetings, the Engineering Extension Service of A. & M. College provides the services of several Itinerant Instructors who conduct district short schools for operators. This program tends to round out the overall education and training program for the entire water and sewage works profession.



● ***HENRIETTA plant, Hasie & Green, engineers, built in 1949.***

As previously stated, this program has done much to assist the operators in the efficient performance of their duties and has also been most helpful to the Health Department in carrying out the many ramifications of the water pollution control program.

Sewage Treatment Policies

Due to the nature of our anti-pollution statutes, and in response to many requests from consulting engineers, it long ago became obvious that some type of standards for the various units of sewage treatment plants were desirable. With the advice and counsel of several committees of the Water and Sewage Works Associations, the State Health Department has developed and published such recommended standards. It is interesting to note that these standards are primarily ones which have been recommended by the operators themselves, and, therefore, reflect their conception of the facilities necessary to produce an effluent which will comply with our existing State anti-pollution statutes.

The State Health Department has constantly endeavored to investigate and encourage economical methods of sewage treatment. In the late 1920's and early 1930's, the Department initiated an intensive educational program encouraging municipalities in certain areas to dispose of the sewage effluent by broad irrigation. Several cities accepted this idea and were soon reporting fabulous harvests and considerable income from the crops. Interest in this arrangement has continued until there are now some 52 Texas munic-

● ***LAGOON installation, Hereford, Parkhill, Smith & Cooper, engrs.***

ipalities utilizing sewage effluent for irrigation purposes. The crops normally grown are cotton or feed crops. This practice has resulted in reducing the organic load which otherwise might be discharged into nearby waters.

Another rather recent development which has aided materially in improving the quality of primary effluent has been the development of sewage oxidation ponds or lagoons. Quite naturally the Department is frequently approached by municipalities desirous of installing or improving treatment facilities, but which cannot provide complete treatment due to financial limitations. As a result of several years of study, the Department determined that oxidation ponds or lagoons in certain areas of the State function quite satisfactorily in stabilizing primary effluent. Consequently, the policy was adopted to accept sewage oxidation ponds as suitable temporary or emergency secondary treatment units. By so doing, we have been able to encourage the construction of this most economical unit for financially embarrassed towns interested in providing or improving needed sanitary facilities. We have also been able to decrease the pollution load discharged from primary treatment units to receiving waters. These lagoons are "flow-through" type installations, designed for a maximum loading of 50 lbs. BOD/day/acre surface area, with effective depth not to exceed 3 feet. Several plants of this type include recirculation pumps so that the algae-seeded lagoon water may be mixed with the raw sewage. This practice appears an important factor in reducing odors in the primary unit. There are now 75 cities served by sewage lagoons; and an additional 15 cities use lagoons in connection with their land irrigation practices, making a total of 90 cities utilizing lagoons as secondary treatment units.

Cooperative Phases

The State Health Department has, for many years, benefited by the wisdom and thinking of numerous advisory committees. The establishment of departmental policy concerning water pollution control activities has been largely governed by such committees. They have proven most valuable in establishing standards, recommending needed legislation, indicating the need for certain studies or research, and for other tasks too numerous to mention. The State of Texas encompasses areas of entirely different physical and economical characteristics; consequently any law, rule, regulation, or policy intended for statewide application must be administered with a certain degree of rationalism. It is quite obvious to us, therefore, that any statewide program (such as water pollution control) must rely upon the guidance of advisory committees to assure success and balance.

Another integral part of our pollution control program is our activity in conducting pollution surveys to determine the sources and extent of pollution. Recently two coastal counties have cooperated with the Department in establishing county-wide pollution surveys. A cooperative budget was established with personnel of the Bureau of Sanitary Engineering supervising the surveys. The data so obtained, coupled with local publicity campaigns, have proven most effective in bringing about needed corrections.

Possibly our biggest pollution problem, as it affects municipal and domestic water supplies, is that caused by oil field brines. When a complaint of such pollution is received, it is necessary to sample the stream from the point of complaint upstream until the stream or creek carrying the brine is definitely determined. It is then necessary to make a lease-by-lease survey to establish each individual contributor, and finally to complete the task by tracing ownership of the leases and transmitting the completed report to the Office of the Attorney General for further action. This entire procedure is a long and tedious one, but has proven most desirable in acquiring evidence for the salt water pollution cases we have investigated. The abatement of the salt water pollution of the Angelina-Neches Rivers by the East Texas oil fields is a matter of record. More recently, legal action was initiated against oil producers contributing to the salt water pollution of the Guadalupe and San Marcos Rivers. This pollution was harmfully affecting the quality of the domestic and industrial water supplies of the cities of Gonzales, Cuero, and Victoria. As a result of evidence collected by this Department, a temporary injunction was obtained and corrective measures have been taken by most producers. The pollution of the Leon River by salt water from the Eastland County oil fields, as it was affecting the City of Temple water supply, has been investigated, and the evidence submitted to the Office of the Attorney General. It is interesting to note that as a result of these actions, we have been able to obtain voluntary corrective action in other oil fields in the State, and we are now receiving excellent cooperation from the producers.

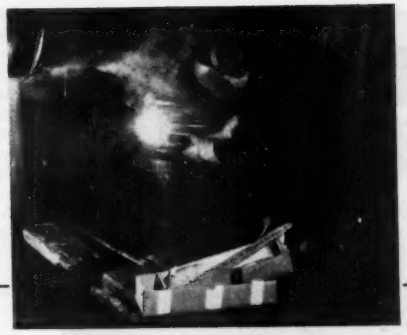
It is sometimes necessary for us to rely upon legal action, as a last resort, to accomplish certain desired results. In this phase of our pollution control program, we have found the Office of the Attorney General

(Continued on page 54)

Courtesy Chicago Pump Co.

● ***PACKAGE plant, utilizing activated sludge, typical of many satisfactory Texas installations serving communities.***

● ***CONTACT aeration, Thorndale, Marvin Turner, engineer.***



● ***FIRST job was to cut out the old valve for removal.***

WELDING-CUTTING EQUIPMENT PAYS FOR ITSELF ON ONE JOB

L. E. BAXTER
Williams & Wilson, Montreal

THE superintendent of the largest rapid sand water purification plant in Canada, The Montreal Filtration Works, was recently faced with the problem of removing from the piping system of Galleries Nos. 1, 2 and 3, about 220 cast iron flanged-end gate valves of 30-in., 24-in. and 20-in. diameter. After many years service, these were to be replaced by new valves of an improved design.

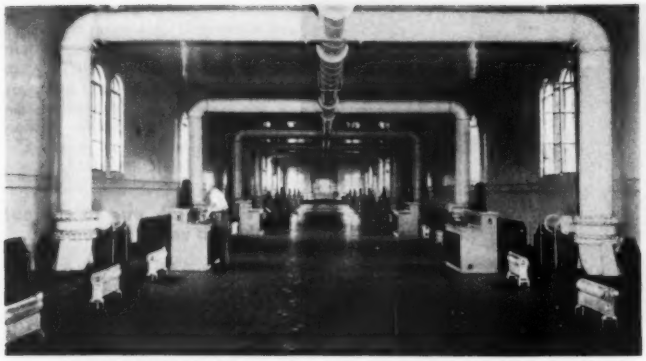
Under ordinary circumstances, such removal could have been readily accomplished by unbolting the end flanges and then lifting or moving the valves from their original positions. However, because of limited clearances and other local conditions, it was found impossible to remove these valves intact and the superintendent decided it would be necessary first to dismantle bonnets, stems and discs, and then to break or cut the bodies into two or more pieces. On a previous occasion, valve bodies of similar type had been broken with a sledge hammer, but in this instance, side and overhead clearances of only 26 to 28 inches precluded the effective use of a sledge and led to the consideration of various other methods, by which the cast iron valve bodies, ranging from 1 to 1¾ inches in thickness could be cut into several sections and conveniently removed.

Selecting a Cutting Method

Neither oxy-acetylene nor arc welding equipment was then available at the plant and it was felt that whatever type of apparatus had to be purchased should be adaptable to as many of the plant's other requirements as possible. To begin with, oxy-arc and carbon powder equipment was ruled out because it would be too expensive and specialized. Second, because of the extremely close quarters in which the work had to be performed, the use of oxygen and acetylene was not feasible. In addition, it was concluded that either of these methods would require the services of skilled operators, with a consequent increase in cost. A local welding company, asked for an estimate on the work, quoted $9 to $10 per valve. This was considered too expensive.

In a discussion with a representative of a manufacturer of welding alloys and electrodes, the city engineers were acquainted with another method of cutting cast iron, which appeared to be the ideal solution to their problem. They found that a 500-ampere transformer type AC arc welder and a special oxygen-less cutting electrode, known by the trade mark of CutTrode, would be the only tools required. Not only would the original investment, therefore, be less, but upon completion of this particular project, the welding machine would still be available for any future welding or

● ***AFTER valve section was cut apart, flanges were pried loose.***



● *INTERIOR view showing operating floor of Montreal filter plant.*

cutting. Formerly any welding or cutting work had to be done by outside contractors.

Another advantage of using this method was that, after only a short period of practice, their own men were able to handle the cutting efficiently, eliminating the need for highly skilled operators.

The welding machine installed was a 500-ampere Westinghouse AC transformer type machine, equipped with an open circuit voltage control that reduced the no-load voltage from 65 to approximately 30 volts. The unit was placed on the gallery above the filters and a 300-foot cable was employed to reach the various valves. Current settings on the transformer were varied until most efficient and consistent results were obtained at 400-450 amperes with a ¼-inch CutTrode. Cables were kept as straight as possible in order to minimize current losses.

One illustration shows one of the valves being cut. The operator found the performance of the oxygenless cutting electrode surprisingly simple, and very quickly was able to obtain perfectly straight cuts in vertical, overhead and down hand positions using this procedure. The electrode is inserted into an electrode holder of any arc welding machine, A.C. or D.C., and the correct amperage selected, depending on the cutting speed desired, size of the electrode and the nature of the job. The equipment can be used to cut any metal. The arc is struck, as in ordinary welding. The rod is then moved up and down fairly rapidly in a fashion similar to sawing. The closer the rod tip to the cut, the less waste of electrode and the faster the cutting. Therefore, the welder keeps the rod right against the molten metal, there being no danger of extinguishing the arc. The special exothermic coating of this patented cutting electrode concentrates the arc heat directly below the tip of the rod. Thus the metal ahead of the electrode is always in a molten state, being forced out long before the core metal ever has a chance to make direct contact with the base metal.

Seepage was found around the work. Since this could not be prevented, the operator wore rubber boots and rubber lined gloves. This rubber clothing, together with the open circuit voltage reducing control were adequate protection for the operator.

Upon removal of the first six valves, cost of the work was computed by the engineering section. The total cost averaged $2.65 per valve, consisting of $1.80 for materials and 85 cents for labor. The contractor's estimate was $9 to $10 per valve. This saving multiplied by 220 valves amounted to approximately $1400. The saving on this one job alone paid for the machine.

Pipe Pusher Saves Cost Many Times Over

Charles W. Bert
Water Manager, Greencastle, Pa.

WE use a Giant pipe pusher for installing service lines and have found it economical and satisfactory. We use it for removing old service lines by digging holes on both sides of the street and then, after removing the old pipe, we push in a new one. We are finished with the job in half the time it required when we had to dig the entire length of the service pipe.

Sometimes, in pushing a new pipe in a new location, we strike a rock. Then we measure the distance that the pipe has been pushed, dig down at that point, remove the rock, and then go on pushing the pipe the full distance.

We have saved the cost of this pipe pusher many times over since we bought it several years ago. It not only saves money on the installation, but it also saves that cost of street repairing that is necessary when a ditch is dug across a much traveled main highway.

Sewage Treatment at Detroit

Average detention in the settling tanks of the Detroit Sewage Treatment plant was 1.3 hours. Average influent BOD was 125.1 ppm; average effluent BOD was 73.5 ppm; reduction was 41.3%. Average influent SS was 210 ppm; effluent 111 ppm; reduction 46.9%. Total solids in the raw sewage averaged 618 ppm and in the effluent 531 ppm.

Digester gas production was 3.67 cu. ft. per pound of solids added; 6.29 cu. ft. per pound of volatile added; and 14.04 cu. ft. per pound of volatile consumed. The digester was completely dewatered for the second time during its nine years of service and interior metal work was found to be in good condition. In sludge filtration, both ferric chloride and ferrous sulphate were used for conditioning. Using ferric chloride, lime dosage was 9.38% and ferric chloride 1.02%, while filter yield was 5.1 pounds per sq. ft. of filter area per hour. Using ferrous sulphate, lime dosage was 12.82% and ferrous sulphate 3.75% (this was reduced materially later), while filter yield was 3.2 pounds. In normal operation, a mixture of 60% ferrous sulphate and 40% ferric chloride is used with good results.

Experiments on chemical precipitation were carried on. Using ferrous sulphate and lime, 20 to 55 ppm of lime and 12 to 50 ppm ferrous sulphate, removal of suspended solids was 78.4%, but the effluent persistently contained pin-point floc. Ferric chloride (1 to 4 ppm) and lime (9 to 13 ppm) gave a clear and sparkling effluent, with a reduction of 73.5% in suspended solids. Experiments were on a pilot plant scale, with a flow of 1 mgd.

Fred Burley is engineer of sewage treatment.

Tennessee Planning Commission Sponsors LOCAL CAPITAL BUDGET STUDIES

CHARLES L. CRANGLE
Acting Director of State Planning, Tennessee State Planning Commission

CITIES in Tennessee are fast becoming sold on capital budgeting as the result of a new program sponsored by their State Planning Commission. Offered as a further service to municipalities in the fall of 1949, the availability of technical aid in this field has aroused a response little short of amazing. At the present time the Commission's Division of State Planning, which is providing this assistance, finds itself in the pleasant, though difficult, situation of having far more requests for assistance than it can handle adequately with present limitations on budget and personnel. Perhaps a short discussion of how a state agency works with local governments on a matter of such vital concern will be of interest to public works officials in other states.

Since 1935, the Tennessee State Planning Commission has rendered service to municipalities in the fields of physical planning, notably zoning and subdivision control. Through the machinery of local planning commissions set up in some 65 municipalities, municipal master plans have been prepared or are in process of preparation. Since the majority of the cities and towns of Tennessee are relatively small and would find it difficult to retain their own full-time city planners, the procedure has proved very beneficial. By contractual arrangements, the municipalities serviced ordinarily make small payments to help meet the cost. In return, they are assured of continuing technical advice on the local planning level.

However, the municipalities of Tennessee have been in the same condition financially as municipalities everywhere else during the past few years. Income has not kept pace with increased demands for municipal services and regular operating costs. Added to this, inattention to municipal finances, the success of "pressure groups" in obtaining city funds for pet projects, and a lack of foresight in considering public works needs have united to place a large number of Tennessee communities in hard straits so far as public works construction is concerned.

Capital Improvements Needed

Since the success of civic master plans is dependent in a large measure upon capital improvements, it was a quite normal extension of the Commission's activities to offer service in the field of capital budgeting. Thus it was that early in 1949 initial discussions were held by the local planners on the Commission's staff with representatives of TVA's Community Services Branch.

It was immediately recognized that most of the published material in the field of capital budgeting concerned the large cities and their financial problems. In order to fit the situation in Tennessee, it was necessary to prepare a hand book of procedures designed especially for use in this State's municipalities, based on the best thinking and experiences of a group which had worked for a number of years with such communities. It was recognized that the hand book could be only theoretical until it was tried out in the field. For that reason, the first step of the Division of State Planning was to embark on a series of demonstration capital budget projects in which it provided the services of its technical people to local planning commissions for the purpose of preparing local capital budgets. As three of these demonstration budgets are completed, it is now possible to state quite definitely the procedure necessary in preparing a capital budget for a small Southern city. While much of what has proven useful in Tennessee may not serve so well in other states, we are assured that capital budgeting for the small Tennessee city is good business, and we now have proof that it can be done as adequately in a small town as it can in cities the size of Philadelphia and San Francisco.

First of all, we have learned that common sense must be employed in preparing any local capital budget. It is all very well to consider the many facilities which the community should have, but in the final analysis the capital budget must be anchored firmly on the basis of ability to pay without confusing the local financial situation any further. In the second place, the capital budget when completed must have both citizen support and the support of the local public officials. In order to obtain such support, it must be logical and be well publicized. When a new service or new piece of construction is proposed, the financing must be worked out carefully and be within the ability of the community to pay. There are those who claim that citizens will support anything until they find it is going to cost them more money; our experience has not run that way. We have found that when, for example, there was local interest in a first-class garbage collection service and it could be demonstrated that present sources of revenue were not able to meet the bill, the inauguration of a service charge was not only favorably received but heartily supported by the citizens at large. We have found that despite the claim that citizens would not support a sewer service charge, when the facts were completely presented to them and they realized that the only way to obtain satisfactory sewer service was either through increased property taxes or a service charge, the service charge invariably won the day as a more equitable

method of bearing the cost. We have found, to state it briefly, that both the citizens and the local public officials will support new revenue charges when the charges make sense and are the means for providing services that otherwise could not be obtained.

In embarking on the capital budgeting service we would not have been surprised to meet at first some local suspicion of our motives, based on the general fear of a state agency and "state control". However, the fact that the Tennessee State Planning Commission has always been a non-political agency and has prided itself on maintaining an impartial technical approach to local affairs has built up local confidence through the years. In giving capital budgeting service, we again took painstaking effort to explain early in the game that the State Planning Commission had no purpose other than that of helping local governments through technical advice to better themselves. As a result we have found no suspicion, but only great interest in taking advantage of the service.

The Method of Operation

Our method of operation has also doubtless helped in reducing local suspicion as to the motivations of a state agency. We have never attempted to undertake too many studies at one time, reasoning that if we got involved with more than we could handle the old bureaucratic technique of playing one off against another might creep in. When we start working with a local planning commission on a municipal capital budget, the staff assigned to that study stays with it practically full time until the study is completed. There is no switching of personnel from one job to another. Understandably, when studies are undertaken in communities close to Nashville, the staff assigned to the work commute from their homes; otherwise, they find living quarters in the community for the duration of the study and in an actual sense "live their work." For several months they become residents of the community, know its people, patronize the local stores, barber shops, and moving picture houses, and it is only natural that they soon develop a deep personal interest in the town's welfare. Our staff does not consist of state officials who ride into town, consult maps at City Hall, and then deliver their opinions as to what should be done. Rather, our people work *with* the local officials, mutually attempting to solve local problems. They have the technical training for the work they are doing, but they work in their shirt sleeves and are just as likely to be found at the city garbage dump talking with the operator as at City Hall collecting figures.

The staff is necessarily young—ranging in age from 25 to 35—but their youth has not in any way made the work more difficult. The general age of local officials in Tennessee has dropped decidedly since the end of the recent war and the municipal representatives with whom we work are more often in their thirties than their forties. Perhaps the enthusiasm of comparative youth helps; at any rate, we are far less likely to hear, "It can't be done, because it never has been done that way," than some almost radical schemes for accomplishing the objectives. The staff has had to advise caution more often than it has had to urge a break with the past.

Our capital budgeting service to communities is rendered, as was mentioned previously, through the local planning commission. While the staff does a good deal of the legwork and all of the technical analysis of such items as municipal revenues, operating expenses, and debt service, the actual capital budget is arrived at step by step through discussion sessions with the local planning body. This approach is deliberately utilized in order to make the completed program one in which all final decisions are those of the local people. The state planning enabling act requires the chief executive officer of the municipality to be a member of the local planning commission. Since primary responsibility for carrying out the capital budget falls to the mayor, it is fortunate that as a planning commission member he can actually participate in the budget's preparation.

It has been stated above that the final decisions on the capital budget are local decisions. For example, in a certain community the technicians may feel very strongly that a certain recreation facility is of major importance, and provision for it should be made in the capital budget. However, if after presentation of the need, methods by which it may be satisfied, and exhaustive discussion, the local officials are still not convinced of the advisability of including the recreation item in the budget, that item does not appear. On the other hand, we may strike a community where a local group is intent upon constructing a municipal airport. We may feel that on the basis of need and operating cost such expense is unwise and may counsel that construction be delayed until at least the more pressing items are cared for. We present the reasons for and the reasons against including any particular item in the capital budget, but in the last analysis the local planning commission makes up its mind as to what is to be included and omitted from the proposed budget. Actually, a few sessions of talking the thing out have almost invariably resulted in agreement.

Once the local planning commission has determined the extent of the capital budget for the municipality, how much the individual items in any one year will cost, and where the money is to be found, the budget is transmitted to the local governing body for its consideration and adoption. Ordinarily our technicians appear with members of the local planning commission at such sessions in order to answer any questions which the city board may have. Further discussion is usually held and the budget then adopted as an official guide to the municipality for a six-year period.

It is important, of course, that the budget be kept a continuing six-year program. We therefore urge that as each new fiscal year approaches, the capital budget be thoroughly reviewed and altered if necessary in the light of changing conditions before putting it into operation. At the same time, the additional programming of one year into the future should be considered and adopted.

Our work has been greatly facilitated by the generous cooperation of the engineers, architects, contractors, and bond houses in Tennessee, with whom the Division of State Planning has had long and satisfactory working relationships. Assistance has been rendered by individuals in these fields on such matters as obtaining cost estimates for particular types of work and possible methods of financing, and this assistance has ordinarily been given at no cost either to the Commission or to the local governing body. These professional people cooperate not only because it is to their advantage to encourage the proper programming of local public works, but also because of the sincere interest they have in the welfare of communities in which they work from day to day.

To date, although the capital budgeting service of the Division of State Planning is still in its infancy, it is evident that our method of operation is working exceedingly well in Tennessee. We believe that success is due to the emphasis given the down-to-earth approach to municipal public works problems, based solidly on local needs.

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Texas Pollution Control Program

(*Continued from page 48*)

most cooperative. According to the policies of that Office, as well as those of the Game, Fish & Oyster Commission and of this Department, before any legal action is initiated, a public hearing is held. At these hearings, the evidence collected by the enforcing agencies is presented, the persons affected by the pollution are given an opportunity to testify, and the offending parties are allowed to express their feelings concerning the situation. In most instances, the offending parties are granted a specified time limit in which to demonstrate their willingness to cooperate by initiating corrective action. At the termination of this "grace period", a resurvey is made, and if the situation is not completely corrected, legal action is initiated against the offenders. This procedure has proven most effective, and to date our record is quite impressive.

Our primary interest in pollution control, however, is in the prevention of damage or in "locking the barn door before the horse is stolen", which we are not always able to do under our present laws. A typical example of this type of situation concerns a Texas municipality having an artificial lake as a source of water supply. On the watershed of this lake is considerable oil development, which, during recent years, is producing more and more brine with every barrel of oil. Even though some producers have built holding pits to keep this brine from entering the watercourse directly, it is quite evident that the salt will so saturate the area and will be of such a concentration as ultimately to increase the salt content of the lake waters. This fact is further evidenced by the records showing gradual increases in the chloride content each year. Whereas at this time this content is below 50 ppm, it can readily be anticipated that, all things being considered, the day will come when this lake will be "salted up" and have to be abandoned. It seems unfortunate that corrective action cannot be demanded at this time so that this condition could be averted.

In years past, detailed stream studies were conducted along our major rivers; however, as these reports accumulated and were compared, it became apparent that these data, although interesting, indicated the stream to be in a comparatively acceptable condition. It was, therefore, decided to forego the river studies and concentrate our efforts and personnel toward promoting better operation and maintenance of existing plants, rehabilitation work and construction of additional or new facilities. The results of this program have proven most gratifying, as is evidenced by the figures given previously. There is still considerable work to be done in this category, however, since our records show that 124 of our complete treatment plants and 108 of our primary treatment plants are overloaded, besides the 14 cities without treatment plants.

Making Special Studies

Any water pollution control program would not be complete without the provision and facilities for making special studies. The Texas State Department of Health has two mobile laboratories for such purposes. One laboratory is now practically confined to the Lower Rio Grande Valley where we are conducting an extensive study (on a pilot plant scale) of the treatment of citrus canning plant waste. This project is a cooperative one with the Federal Government (under provisions of Public Law 845), the State, local civic groups and growers and canners associations of the Valley. Our other laboratory is almost constantly on the move, making studies of lagoon installations, efficiency studies of treatment plants, limnological studies of rivers and streams, and studies on various industrial waste and waste treatment processes. We have a graduate biologist assigned to this laboratory and he has been able to furnish us valuable information relative to the biological aspects of sewage lagoons, and the possible use of biological data in connection with stream studies.

We, engaged in pollution control activities, are extremely fortunate in one respect at least. Thus far the industrial development in Texas has been concentrated generally along the Gulf Coast. This has greatly lessened our industrial waste pollution problem as it affects fresh water. Some industrial waste pollution of tidal waters has resulted in conditions affecting marine life, but both this Department and the Game, Fish & Oyster Commission are receiving excellent cooperation from most industries, and tremendous strides are being taken by industry to provide adequate and effective treatment works. Our inland industries generally are pollution conscious, and we receive relatively few complaints concerning their waste disposal facilities.

Probably our most serious problem in attempting to obtain adequate treatment facilities is in dealing with municipalities not having sufficent funds for the required improvements. Texas has a law limiting the extent of bonded indebtedness of municipalities or districts; consequently when this limit is reached (and it almost always is), no additional tax bonds can be issued regardless of the gravity of the situation. Naturally a city in such financial straits would have difficulty in attempting to raise the necessary finances by revenue bonds. We fail to foresee any solution to such cases, unless a sizable revolving fund could be provided by the State for this purpose.

The most important cog in our pollution control organization is, of course, our field personnel. We have the State divided into six districts. District No. 1, with headquarters in Lubbock, includes 62 counties, comprising 59,404 square miles; District No. 2, with headquarters in Fort Worth, includes 37 counties, comprising 34,042 square miles; District No. 3, with headquarters in Tyler, includes 34 counties, comprising 25,682 square miles; District No. 4, with headquarters in Houston, includes 38 counties, comprising 32,786 square miles; District No. 5, with headquarters in San Antonio, includes 30 counties, comprising 27,934 square miles; and District No. 6, with headquarters in Kerrville, includes 53 counties, comprising 85,476 square miles.

Each District Office is under the direction of a District Engineer, and he, in turn, directs the activities of the Water Pollution Control Engineer (usually an engineer assistant or junior engineer) assigned to his district. This District staff carries out all the various phases of the pollution control program. They assist cities in the rehabilitation of their plants; they train operators in maintenance procedures and the conduct of simple tests; they participate in the regional association meetings; they encourage and promote new systems; they conduct preliminary pollution surveys; they survey and study existing plants and submit reports to the central office with recommendations for improvements, which are, in turn, forwarded to responsible officials; they obtain flow and strength data for consulting engineers who are planning plant improvements. In short, these field engineers are the

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very heart of the entire program. It is through their interest in, and devotion to, their duties that the water pollution control program of this State is making such progress.

Fields for Improvement

In studying our overall water pollution control program, we have concluded that favorable consideration of the following recommendations would assist materially in improving and enlarging our program:

1. Consideration should be given to some satisfactory arrangement wherein "cumulative or implied" pollution could be corrected before a critical state is reached.

2. An arrangement would be desirable whereby financial assistance could be offered by the State to municipalities for the construction of adequate treatment facilities. Such assistance should be offered only after it was determined that the city was unable to provide for finances itself, and that the sewage plant effluent was creating nuisances or resulting in possible hazards to public health. Proper provision for repayment of the loan should, of course, be included.

3. Serious consideration might be given to provision of necessary State funds to insure the continuance of the present water pollution control program, should the Federal program be drastically curtailed.

4. Since most of our industrial pollution and a considerable amount of domestic pollution is concentrated along our coastal area, consideration might be given to amending our present statutes so as to require proper and adequate treatment of domestic and industrial wastes before discharge into tidal waters.

5. Consideration should be given to the enactment of legislation requiring the injection of oil field brines to deep sub-surface strata, especially where such oil development is located upon a watershed which serves as a source of municipal or industrial water supply, and where the chloride content of the raw water supply is being noticeably affected.

6. Consideration might well be given to the provision of sufficient funds to establish research facilities for the State Department of Health in order that cheaper and more effective methods of sewage treatment might be developed.

7. It would be desirable to have legislation requiring the submission of plans for industrial waste treatment works to the State Department of Health for approval.

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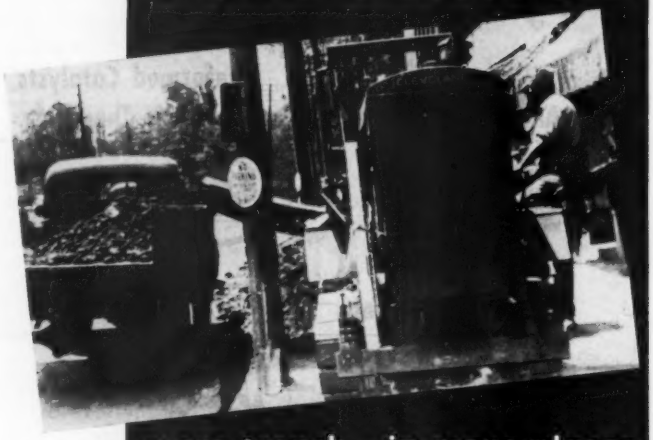

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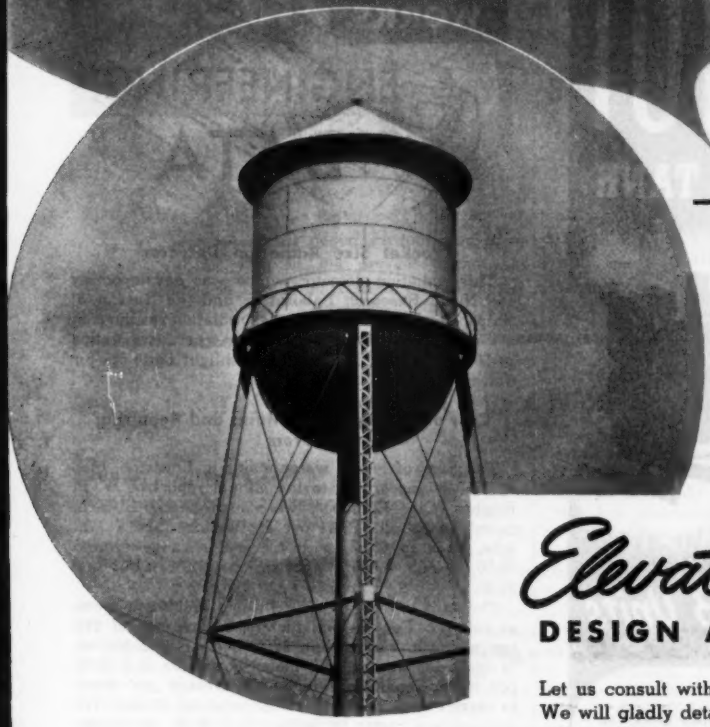

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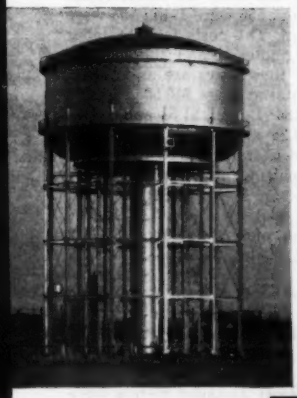

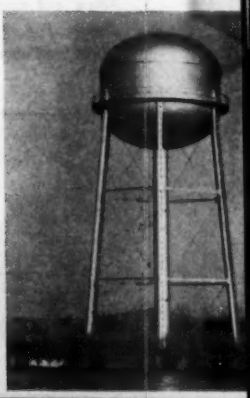

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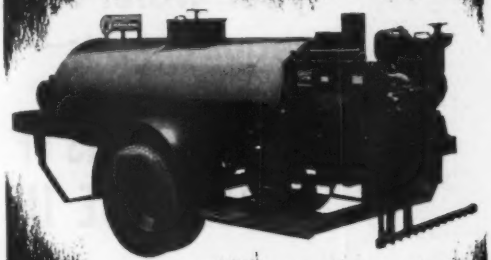

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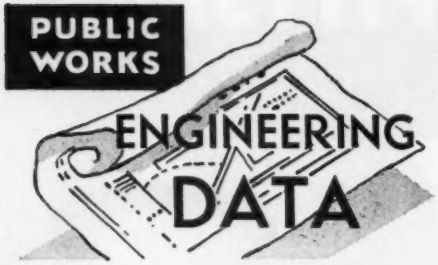

Pocket Size Radiation Detector

This radiation detector, which was developed by the Naval Research Laboratory and the Bureau of Ships, weighs 2 pounds. It gives radiation readings on a visible scale from 0.005 roentgens per hour (safe) to 500 rph (hot). It uses two flashlight batteries for power.

Cost of Laying Water Mains and Repairing Meters

The costs of laying water mains in Lewiston, Ida., in 1949-50, according to the annual report of W. P. Hughes, City Engineer, were as follows: 16-inch, based on 732 ft., $8.44 per ft.; 6-inch, 7,091 ft., 12 jobs, $2.39 to $3.52, with the major range around $2.70; 4-inch, 1,040 ft., three jobs, $2.38, $1.92 and $1.45.

The unit cost of meter repairing and testing was as follows: For ⅝-inch meters, an average of 21¢ per meter in service and $2.25 per meter repaired; ¾-inch, 16¢ average per meter in service, and $1.47 per meter repaired; 1-inch, 22¢ average per meter in service and $1.13 per meter repaired; 2-inch, 11¢ average per meter in service and $7.92 per meter repaired.

Cost of Installing and Repairing Meters

DETROIT installed 12,161 water meters in the fiscal year ending June 30, 1950. Of these, 10,523 were ⅝-in.; 722 were ¾-in.; 556 were 1-in.; 158 were 1½-in.; and 107 were 2-in. The costs for (1) labor and cartage and (2) for material and the average total cost of the work for these sizes are as follows: ⅝-inch, 88¢ and $15.62, total average $16.50; ¾-inch, $1.01 and $21.33, total $22.34; 1-inch, $1.51 and $34.60, total $36.11; 1½-inch, $4.25 and $63.51, total 67.76; and 2-inch, $4.51 and $94.78, total $99.29.

The average cost of repairing meters damaged by frost was, for ⅝-in., $3.75; for ¾-in., $4.61; for 1-in., $6.12; for 1½-in., $17.56; and for 2-in., $23.71. The average cost for repairing meters damaged by hot water was: ⅝-in., $4.28; ¾-in., $5.51; 1-in., $7.78; 1½-in., $19.70; and 2-in., $25.55. Labor costs were about the same as for meters damaged by freezing, but material costs were greater. Average costs for repairing meters damaged by "wear and tear" were: ⅝-in., $3.77; ¾-in., $4.28; 1-in., $5.62; 1½-in., $8.46; and 2-in., $10.76.

During the year, 1,216 frost damaged meters were repaired; 7,474 damaged by hot water; and 21,592 damaged by wear and tear. Also, 47,109 meters were tested, all from full flows to 1/32-in. Average costs were ⅝-in., 13½¢; ¾-in., 18.2¢; 1-in., 32¢; 1½-in., $1.02; 2-in., $1.55; 3-in., $5.10; 4-in., $6.80; 5-in., $11.05; and 6-in., $12.75.

PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

SEWERAGE AND REFUSE... 59
HIGHWAYS AND AIRPORTS... 65
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THE SEWERAGE AND REFUSE DIGEST

Civil Defense for Sewage Treatment Plants

Most defense measures for a sewage treatment plant are those applicable to industrial plants and public buildings; but consideration must be given to the possibility of flooding of buildings by broken sewage or sludge lines. Detailed drawings of the plant should be stored at more than one place, at least one of them 5 miles or more from the plant. A list of the plant personnel should be supplied to each member of it and to the local defense organization. The greatest danger of radio-activity will come from materials washed into the sewers and so to the treatment plant; but they probably would not reach there until after the attack. To provide against the possibility of a sludge gas line being broken, there should be kept on hand one or more masks with an independent supply of air. Radioactive materials from a large area may be washed to the plant, and some instrument for detecting concentrations of such materials should be available. In case broken sewers necessitate removal of night soil by pails, it can be treated at the sewage plant if diluted with 20 or 30 gal. per person, using water or plant effluent.

Ralph E. Fuhrman—"Civil Defense for the Sewage Treatment Plant;" *PUBLIC WORKS*, April.

Treatment of Plating Wastes

In devising a solution of the problem of disposing of plating wastes, first attention should be given to the plant itself. Areas around tanks containing toxic chemicals should be curbed and a separate mat underneath should drain any accidental spills or leaks by gravity to a non-overflowing tank. Of the many methods of treatment available, alkali chlorination is the one recommended. Chromium wastes are most readily treated by reduction and precipitation with lime. Sulfur dioxide and sodium metabisulfite are preferred reducing agents; however, a local source of waste acid pickling liquor may make ferrous sulfate more advantageous. Mention is made of the possible use of metal pyrophosphates in place of metal cyanides to eliminate cyanide completely from plating rooms.

J. E. Cooper—"Treatment and Disposal of Plating Wastes;" *Sewage and Industrial Wastes*, March.

Vegetables Grown On Polluted Soil

Experiments were conducted at a sewage-irrigated farm in New Jersey to evaluate and compare the extent of the coliform contamination on tomatoes grown in a polluted environment and in a similar but uncontaminated environment. The pollution consisted of either furrow irrigation or direct application of feces suspensions to the fruit. Little evidence could be found of a relationship of the coliform concentration on the vegetables to the height of the fruit above the ground. The splashing of the soil upon the fruit during rain is apparently not an important factor in carrying contamination to fruit above the ground. Complete exposure of tomatoes to the sun results in lower coliform concentration on the surfaces of sound fruit. Of tomatoes grown on the irrigated land, only those with abnormal cracked stem ends showed higher surface coliform concentration when irrigated simultaneously with sewage, as compared with those grown on soil that had received irrigation only before planting or on soil that had never received sewage. When feces or *E. coli* suspensions are applied directly to the surfaces of growing tomatoes, the residual coliform concentration decreases to or below that of uncontaminated controls by the end of 35 days — possibly considerably sooner. It was concluded that if sewage irrigation or nightsoil application is stopped one month before harvest, the fruit, if eaten raw, would not be likely vectors for the transmission of human bacterial enteric diseases.

Willem Rudolfs, Lloyd L. Falk and Robert A. Ragotzkie—"Contamination of Vegetables Grown in Polluted Soil;" *Sewage and Industrial Wastes*, March.

Digester Gas At Lansing, Mich.

Lansing disposes of all its garbage by grinding at the sewage treatment plant and treating with the sewage at a plant built in 1937-38, designed for 9 mgd. It has handled up to 15 mgd, and a plant is now under construction to handle 20 mgd, or 40 mgd with partial treatment through primary settling tanks. The original plant had 4 digesters with a total capacity of 294,000 cu. ft. The new plant will add 6 digesters with 1,038,000 cu. ft. During 1949, gas production averaged 250,000 cu. ft.

per day, with maximums of almost 280,000. It is a minimum on Sundays and reaches a peak on Tuesdays, lagging 24 to 30 hr. after the addition of Monday's peak of garbage collection. During gas peaks, the excess goes into the gas holder, to be withdrawn during periods of low production. The original plant had a 25,000 cu. ft. gas holder. The new plant will contain a "Hortonsphere" to supplement the gas tank. By use of photoelectric cells, whose light rays are obstructed by a plate attached to the movable part of the gas holder, gas is pumped into the Hortonsphere when there is an excess and bled out of it when demand exceeds production. It is calculated that the gas is worth 45.7¢ per 1,000 cu. ft. when used to replace fuel oil at 10¢ per gallon; 41.7¢ when replacing power at 1.25¢ per kwh, and 30¢ when replacing coal at $12 a ton.

Glenn P. Manz—"Six New Digesters;" *American City*, April.

Effect of Home Garbage Grinders

In a report on refuse disposal for Los Angeles County Sanitation Districts, A. M. Rawn calculated that the use of home garbage grinders would increase the total BOD of the sewage by 47%, the soluble BOD by 65%, and the suspended solids by 39%, and more than double the grease content. If the garbage is collected and ground at central stations, he estimated the cost of grinding and administration would be $1.09 per ton of wet garbage, and disposal would cost $0.13 a ton; while a revenue of 8 to 15¢ per ton of sludge from wet garbage could probably be obtained.

"Central Garbage Grinder Stations;" *American City*, April.

Aftergrowths in Streams Receiving Chlorinated Sewage

Indications having been noted that there might be a bacterial aftergrowth in streams receiving chlorinated as well as unchlorinated sewage, the authors studied the effect of dilution of chlorinated sewage with different types of water on the numbers of coliform organisms after storage. They found that coliform organisms might multiply in streams, food being one probable controlling factor and the amount of residual chlorine in the sewage another. The higher the residual chlorine and the fewer the coliform organisms remaining in the effluent, the greater the subsequent multiplication upon dilution with stream water. This, it is suggested, may be due to the predatory protozoa normally existing in the diluting water. If chlorination elminates protozoa to a greater extent than bacteria, then the greater the chlorine residual in the diluted effluent, the greater the destruction of protozoa and therefore the less the control they exert on the multiplication of bacteria; and the lower the dilution, the higher the chlorine residual in the diluted effluent. The increase in numbers of coliform organisms takes place within one day after dilution. There was no material increase when chlorinated sewage was diluted with sea water.

H. Heukelekian—"Aftergrowth of Coliform Organisms in Streams Receiving Chlorinated Sewage;" *Sewage and Industrial Wastes*, March.

Experience with Garbage-Sewage Disposal

At Jasper, Ind., of 1100 residences and 167 commercial and industrial establishments, 790 had been provided with garbage grinders up to October, 1950, and 1,000 were anticipated by the end of that year.

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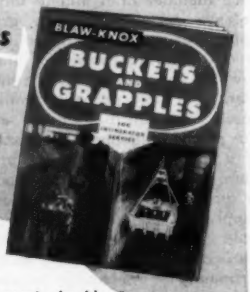

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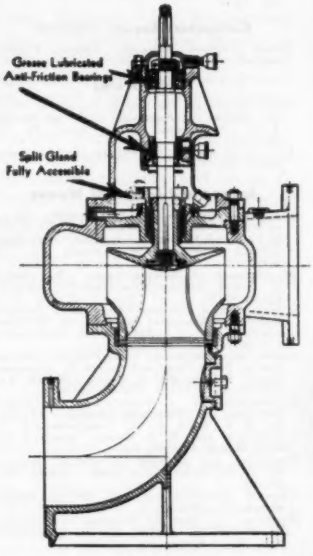

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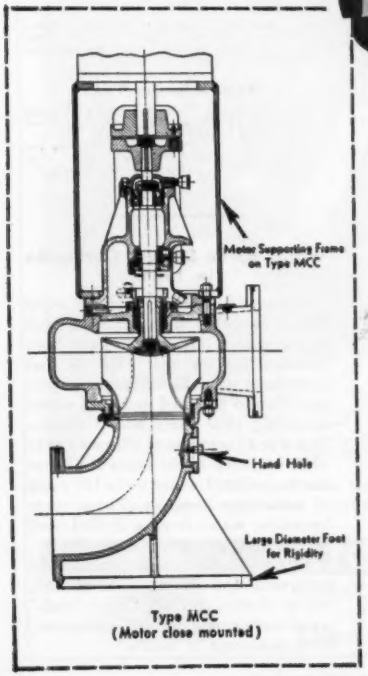
with base elbow suction nozzle



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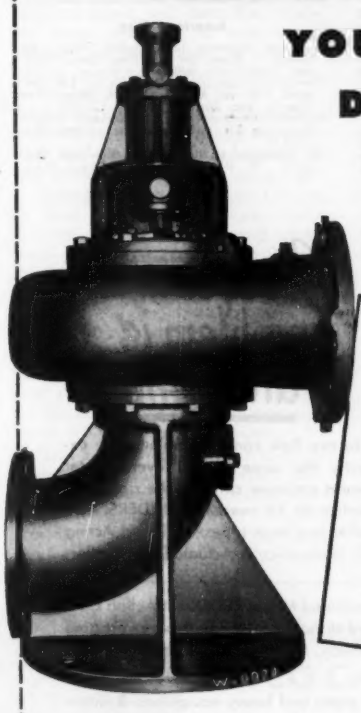

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Bulletin W-317-B16 describes the various Mixflo types made in 10", 12" and 16" sizes. Worthington also builds Mixflos in sizes up to 84", with open or closed impellers and for horizontal or vertical drives. For more Mixflo facts that prove *there's more worth in Worthington*, contact our nearest District Office. Or write to *Worthington Pump and Machinery Corporation, Harrison, N. J.*

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After approximately 3 months of operation, engineers of the State Board of Health found that there is an increase in grease concentration in the sewage, but not enough to cause any problem at the treatment plant. There were moderate to large quantities of grit, ranging from 2.5 to 14 cu. ft. per m.g. of sewage, extremely high in organics. There was a heavy primary sludge with concentrations up to 7½%. No unusual problems had been observed at the treatment plant, or in the sewers or the plumbing.

B. A. Poole and George K. Erganian—"Recent Developments in Dual Disposal;" *Sewage and Industrial Wastes*, March.

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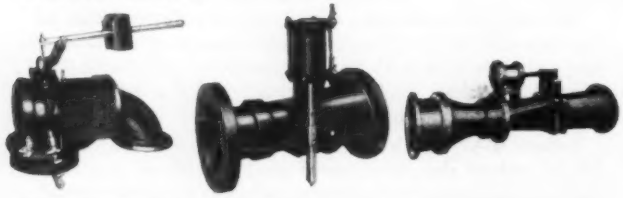

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Water Borne Disease Outbreaks in 1949

Disease outbreaks in the United States traceable to water, milk, milk products and other foods have been reported for the year 1949. In that year there were 25 outbreaks of disease due to polluted drinking water, involving 1570 cases and 3 deaths. This was an increase of 951 cases over 1948. Included in the cases of disease due to polluted water were 125 cases of infectious hepatitis. These were traced to water from a drilled well serving a school near Glide, Ore.

Milk and milk products caused 15 outbreaks and 246 cases of disease, but no deaths, in 1949; "other foods" were responsible for 367 outbreaks, 9,043 cases and 11 deaths.

A Water Works Material Inventory System

The Borough of Wallingford, Conn., of which Vincent Mascia is Water Works Superintendent and Engineer, has installed a new inventory system. Under this, requisitions are issued for all materials used on each job every day. These requisitions are entered on standard forms which show purchases and issues. A physical inventory is taken every six months. All brass goods and galvanized fittings are kept in bins numbered to correspond to the cards. During the year that the system has been in use it has been very satisfactory.

Daytona Paving

(*Continued from page* 35)

storm sewers, but it was a question how not to affect winter tourist season traffic, which now is at its height. However the contractors are getting a head start in the work, and have 300 days in which to complete the entire program.

Plans call for grading the north half of Bay St., first, leaving the south side open for traffic. Then the crews and traffic will alternate sides. A six-inch concrete base course will be laid on top of the grade, a one-inch thick layer of asphalt cement will be laid for the surface course.

On a 100-foot right of way the finished street will have four traffic lanes, totalling 46 feet wide, flanked on each side by 16-foot paved parking areas, making the entire paving width 78 feet. A two-foot concrete curb and gutter section will be poured. Parkage on each side will be about two feet inside the sidewalk.

Mixing a batch of asphalt for use is just like mixing a cake—only harder. And the sounds and odors that go with whipping up layers of streets obviously aren't as pleasant as those that come out of the kitchen, judging from protests of Holly Hill residents near the asphalt plants. The complaints prompted the Holly Hill Council at its meeting recently to revoke the license of the plant until the noise and dust they whip up are eliminated.

This revocation however did not cause any delay in the paving program, because that particular demand for asphalt had been met. The resident engineer for the street program said that when the plant did start operating again he hoped these difficulties would be ironed out. In the meantime J. D. Manly, an official of Brinson, Cone and Manly, street contractors conferred with the mayor and the trouble was remedied.

Despite the noise and dust, contractors and engineers on the project take more care in preparing a batch of asphalt than the average housewife takes in whipping up a pineapple upside down cake. Each ingredient going into the asphalt mix is accurately weighed; it is tested to make sure of its quality; and the whole batch is analyzed, as a whole and by its separate parts both before and after the batch is prepared.

Two types of asphalt cement are being used on our streets. One is a mixture of Trinidad Lake blended asphalt and sand of varying degrees of fineness. This mixture is used for the 1½-inch leveling course which will smooth out the bumps and humps in our streets. The other type contains the same ingredients, except that it has a greater percentage of very fine stone dust which gives it greater stability. This mixture is sheet asphalt and is used

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for the 1-inch surface course on which our cars will ride.

To prepare the asphalt cement two plants have been put up. The larger plant produces sheet asphalt and the smaller one makes the leveling course. The engineers have put up a testing laboratory. Here a crew of technicians carefully screen the sand, run penetration tests on the asphalt blend and generally act as watchdogs to make certain that the specifications are followed in the preparation of the finished product.

The sand comes from three places: Interlachen, Ormond and Mount Ararat. Samples from each batch are passed through a series of screens, each of which has a finer mesh than the preceding one. The "specs" call for certain percentages of these "passing" in each batch of asphalt cement. The stone dust used in making sheet asphalt is much finer than even the smallest grained sand. It serves to fill in the tiny spaces between the sand grains and adds stability to the mixture, thus giving it greater strength.

Now let's mix a batch of sheet asphalt. First the sand is placed in a hopper in its proper proportions and passed through horizontal revolving drums in which it is dried and heated to between 325 and 375° F. Then the sand goes up a "hot elevator" to the sand bins at the very top of the asphalt plant. The fine dust, meanwhile, is carried up another elevator to the dust bin, also at the top of the plant. The amount of dust used in each batch is measured by weight. And, as Johnson explained, the amount depends on the sieve tests of the sand. Thus it can change from batch to batch. But it isn't supposed to exceed or fall below the limits prescribed in the specs.

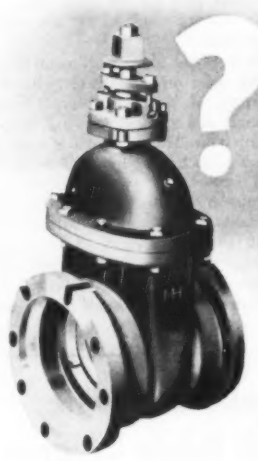
While all this is going on, the asphalt is being heated and agitated in the tank cars in which it is shipped here. The blend comes from the Mexican Petroleum Products plant in Savannah. Johnson said this blend is running between 33 and 40 percent of Trinidad and the rest petroleum asphalt. The heated asphalt blend is piped from the tank car into a hopper in the plant, the amount being carefully weighed. The specifications call for from 12 to 14 percent of blended Trinidad asphalt in each batch of asphalt cement.

Now we have the sand and the stone dust in the bins up at the top of the plant, and the asphalt blend in the hopper. The sand and dust is given a final screening. Then all three ingredients: sand, dust and asphalt are turned loose into the mixing box. First the sand and dust are dropped in and mixed for 15 seconds. Then the asphalt blend is added and the whole batch is mixed for another 45 seconds.

The mixing box is called a "pug mixer." It consists of a metal box through the center of which runs a horizontal shaft. To the shaft are attached a series of arms which are capped by metal paddles which resemble horses' hooves, and which are set at varying angles to each other, in the manner of an automobile crank shaft.

The sheet asphalt plant has a 2,000-pound capacity. The smaller plant has a 1,000-pound capacity mixer box.

While the batch is being mixed, a truck rolls up underneath the box. A trap door opens and the finished mixture now called asphalt cement, drops into the truck. It is still hot —from 300° to 350°. A tarpaulin is placed over the top of the truck body to retain the heat, and the truck is on its way to the construction site.



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Purchase price (or first cost) of a valve is not its real cost. Maintenance engineers appraise the true cost of a valve as cost per year of service—i.e., purchase price plus maintenance costs divided by years in operation.

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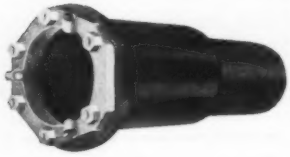

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PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Reducing Frost Damage

Speaking from experience with New York State highways, the senior soils engineer of the State Dept. of Pub. Wks. says that most roadside ditches could safely be made deeper and wider. Rock ledges just under the bottom of a ditch may block the flow of groundwater, causing the foundation to be saturated. An excessive growth of underbrush along the back slopes of narrow cuts sometimes connotes a subsoil full of roots that defies drainage. The most satisfactory method of dealing with cuts in non-drainable soils is to undercut to a depth of at least 40 to 60% of the normal depth of frost penetration and replace with drained medium sand. Boulders embedded in the foundation soil have a way of working up to the pavement and raising it. In one case the problem was met by undercutting to a depth of 4 ft. below the finished grade and refilling. Rock cuts usually have a rough surface full of undrainable pockets, which may be filled to a level surface with bituminous mix or low-grade concrete. Or 12″ of gravel can be placed over the rock cut under the pavement.

Earl I. Fuller — "New York Reduces Frost Damage;" *Better Roads*, March.

Sign Legibility

In studying the legibility of road signs of different characteristics, the California Div. of Highways compared those using all capitals with those using lower case. It has been stated that most readers definitely do not like to read material printed entirely in capitals, and the same might be true of signs. To the argument that all sign lettering should be uniform it was replied that distinction might be better than uniformity. To test this, signs were prepared using three different sizes of each style of letter in 24 names which were placed, 6 at a time, on an overhead sign bridge. More than 50 observers, with various efficiency of eyesight, walked slowly toward the sign bridge and each noted the distance at which he could first distinguish each word. This test indicated that an average name having 7 letters and a length of 8 ft. can be read, by daylight, at 1560 ft. if of lower case, and at 1380 ft. if all capitals; or at night, at 1130 ft. and 1050 ft. respectively. Comparing also size of letter, the ratio between inch of height of letter, and distance in feet at which it can be distinguished was as shown in the table.

Karl Moskowitz and Glen Morgan — "Sign Legibility;" *California Highways and Public Works*, January-February.

Maintenance Work by Contract

Some road departments do as much maintenance work as possible by contract, the kind usually depending largely on whether the work can be clearly defined and paid for on a unit-price basis. Routine day-to-day operations are almost always handled by department forces. Work such as motor patrol blading, patching and cleaning shoulders and ditches is not easily measurable. Many road departments let application of bituminous seal coats and regraveling by contract. Several counties report that contractors are not interested in maintenance work and there is not enough competition to keep bids for it reasonably low. A Minnesota county reports that it does not contract blading, gravel replacement etc. by the hours' use of equipment, since their own motor graders cost $1.80 to $2.40 per hour, plus operator, while bids on work where motor graders are used have been $6.50 to $7.00 per hour, including operator, who is paid approximately $1.50 per hour. The Minnesota State H'way Dept. "gets good results from letting maintenance work to contract. It relieves us of the necessity of owning equipment that is required only seasonally and we do not have the problem of employing labor and skilled help on a seasonal basis." However, there are some items that can not readily be contracted. In Iowa, probably no county contracts its mechanical maintenance. The only maintenance operations that the New Jersey H'way Dept. handles on a contract basis are the furnishing and application of liquid bitumens and some hot plant-

Legibility of Highway Signs

	Lower case per inch of loop height		Capitals per inch of height	
	average observers	near-sighted observers*	average observers	near-sighted observers*
Bright daylight	131 ft.	102 ft.	114 ft.	90 ft.
Illuminated, night	95 ft.	74 ft.	87 ft.	69 ft.

*Whose reading distance was exceeded by 85 percent of observers.

Courtesy California Highways & Public Works

● ***TEST letters used in determining legibility of signs.***

mixed bituminous repairs; these require skilled operators, which are not available in the department, and distributor equipment is expensive and would be used during only a relatively small part of the year. The Illinois highway dept. contracts bridge painting, patching of concrete and bituminous pavements, sealing of bituminous surfaces, and corrective grading of shoulders and ditches; which jobs are readily measurable and defined by specifications.

"Maintenance Work by Contract?;" *Better Roads*, March.

Construction Equipment In Adams County, Wash.

This county contains 2070 miles of roads; 970 miles improved, which carry 90% of the traffic. Their equipment comprises 9 motor graders, 7 dozer-equipped tractors, 3 scrapers, a ripper, 10 pull-type graders on rubber, a compressor, concrete mixer, bituminous distributor, power broom and roller, 2 tractor mowers, 14 dump trucks, a truck shovel, 3 loaders, a portable crusher, and an elevating grader. They find the elevating grader to be "the cheapest method ever devised for side-casting or loading dirt into trucks. Besides its use on new grading, side-casting comes into play in clearing many miles of silted ditch-line. . . . For the sake of economy we tackle only the longer stretches of silted ditches adjacent to places where quantities of dirt are needed, either to raise old grades or to fill washouts. In this operation the elevating grader loads trucks. . . .It is killing two birds with one stone."

W. W. Athey — "County Road Department Runs Fairly Big Business;" *Better Roads*, March.

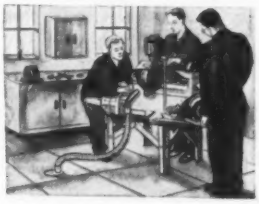
Pre-Treating Surfacing Aggregate

Cincinnati, Ohio, in maintaining its 7,000,000 sq. yd. of bituminous pavement, surface-treats it at about 6-yr. intervals. This treatment consists of a seal coat covered with ⅜" of crushed stone or slag, or ¼" of uncrushed pebbles. This has been satisfactory except for dust and cost of removing loose aggregate. To remedy this, it considered pretreating the aggregate, and made tests of several combinations of MC-1, 2 and 3; SC-2; MS-2; RS-2 and 3, and SS-1; combined with wet and dry crushed and uncrushed stone. Dried crushed stone was pre-treated with ½% of MC-2 and stockpiled for 10 days, then spread at 18 to 19 lb. per sq. yd. and rolled with 8-ton steel wheel rollers. Both dust and pickup of loose stone were reduced; but not so much as either of two other combinations. One of these was dried ⅜" crushed slag pretreated with 1% MC-2 in a pugmill mixer. Laid as above, the aggregate was picked up by traffic unless the road was closed for four hours after finishing; but there was almost no dust or loose aggregate.

Best of all, and the one adopted because there was practically no dust or clean-up and negligible pick-up, and also it was the least expensive, was the use of undried crushed and uncrushed aggregate, pre-treated with either MC-2 asphalt, or tar oil Primer T in a continuous screw-type mixer. The former was spread over a seal-coat of asphalt emulsion RS-2, and the latter over a tar seal-coat of RT-8; at a rate of 16 to 18 lb. per sq. yd. There is little difference in the bonding of ⅜" crushed and ¼" uncrushed aggregate.

Robert C. Lewis — "Pre-Treated Aggregate Improves Street Surfacing Operations;" *American City*, April.

SCHOOL SHOPS REQUIRE THE REMOVAL OF POISONOUS GASES



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Soil-Cement Base in North Carolina

As of Dec. 1, 1950, 667.87 miles of soil-cement base course had been constructed in North Carolina. It is used in competition with other types of bases because it has proved to be just as satisfactory, relieves a shortage of aggregates, and contractors are equipped to do this type of construction. It is made of the same thickness as other types of materials — usually 6" but in some cases 8". The amount of cement used ranges between 8% and 16% by volume, varying with the soil. Contracts are let for processing, the concrete being purchased by the State. The price for processing has ranged from 42¢ per sq. yd. in 1946 to 21¢ in 1950. This decrease is attributed to three factors: 1 — improved construction methods developed by the contractors and equipment concerns; 2 — experience gained by the contractors, resulting in the elimination of many of the difficulties that had been experienced; and 3 — competition in a type of work that was proving successful and was being offered in considerable quantities. While the cost of processing was declining, the cost of cement was rising, so that the total cost per sq. yd. remained almost at 80 to 82¢ until 1950, when the cost of processing dropped to 21¢, probably because of the large amount of this work offered — 2.44 miles in one year. The wearing surface of a soil-cement base must be impervious. In North Carolina the surface applied is a double mat bituminous surface treatment about 1" thick, or 100 lb. per sq. yd. of plant-mix bituminous pavement.

L. D. Hicks — "Soil-Cement Base Course Methods in North Carolina;" *Roads and Streets*, March.

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Better Roads

County Road Department Runs Fairly Big Business. By *W. W. Athey*, County Rd. Engr., Adams Co., Wash. March, Pp. 21-22, 35.

New York Reduces Frost Damage. By *Earl T. Fuller*, Sr. Soils Engr., N. Y. State Dept. of Pub. Wks. March, Pp. 23-24, 38.

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A Procedure for Determining the Annual Cost of a Section of Rural Highway. By *Harold W. Hansen*, H'way Engr., BPR. April, Pp. 141-147.

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Heating Bridge Decks and Pavements. By *G. S. Paxson*, Bridge Engr., Oregon State Highways. April, Pp. 103-104.

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Minnesota Practices in Salvaging Old Pavements by Resurfacing. By *O. L. Kipp*, Chf. Engr., and *C. K. Preus*, Asst. Engr. of Materials. Minn. Dept. of Highways. March, Pp. 81-90.

The Surveyor

Principles of Signposting. By *R. S. Gallaher*, Sr. Eng. Asst. March 16, Pp. 155-156. March 23, Pp. 177-178.

THE MICROSTRAINER IN WATER FILTRATION

JOHN R. BAYLIS
Engineer of Water Purification, Chicago, Ill.

TO reduce microorganisms in water and avoid the rapid increase in loss of head in filters, microstrainers have been used in England on an increasing scale. Two types of strainers may be used. One is a fixed strainer, in which the wire cloth remains fixed and is cleaned intermittently after becoming clogged. The other is an automatic strainer, in which the wire cloth is self-cleansed as the unit continues in operation. The strainer that will be described here is the revolving drum type. A small straining unit was borrowed from a filter manufacturer to test its efficiency in removing micro-organisms from the Lake Michigan water.

The unit is mounted in and on a steel tank 4 ft. by 7.5 ft. in plan, and 3.5 ft. in height. The tank is divided by a partition into a small raw water chamber at one end, and the strained water chamber. The drum of the unit, 2.33 ft. in diameter and 2.2 ft. in length, is located in the strained water chamber. The drum is about two-thirds submerged in water, with unstrained water on the inside. It is driven by an electric motor direct connected to a variable speed gear reducer. The drum at present may be revolved at speeds of 0.25 to 1.65 rpm. Before changes were made, it could be operated at rates between 1.25 and 8 rpm, but was operated most of the time at 1.25 rpm.

The Revolving Drum

The revolving drum is of iron-framework construction, and is covered on the periphery with a screen strainer. This consists of a fine wire cloth called "micro-fabric" (equivalent to 75,000 openings per sq. in.) overlaid with 8-mesh stainless steel wire screen for strength. The wire cloth is held by the mesh wire, which is securely fastened to the drum at each end so as to leave a 2 ft. width of the wire cloth exposed to the water. This gives a straining area of 15 sq. ft. The downstream end of the drum is closed and has a water-lubricated bearing for support. The upstream end is fitted with a spoked ring and trunnion bearing on the drum axis. The spaces between the ring and spokes form the inlet to the drum.

Inside the drum is a hopper-shaped waste water trough with its lip above the unstrained water level. The cleaning arrangement consists of a row of jets outside the drum at the top. The jets penetrate the strainer and flush the solids removed from the water into the waste trough. The drain from the trough passes through the center of the bearing on the down-stream end of the drum. Longitudinal lifter bars inside the drum discharge into the waste trough any solid that does not adhere to the strainers. The jet nozzles for the micro-fabric have very fine slots and are arranged to give an almost continuous vane of water across the strainer. Transparent splash guards prevent the water splashing over the machine. The wash water line has a meter inserted for measuring the flow of water and it also is provided with a gauge for regulating the flow.

Rate of Flow and Efficiency

A 4-inch adjustable-height overflow pipe connected to a 6-inch pipe that passes through the wall of the unit forms the overflow in the strained water chamber. With a set rate of flow, the water level in the inlet will build up higher than that of the strained water chamber so as to force the liquid through the wire cloth. A head of 1 to 2 inches generally is required. Most of our work has been done with a head differential of about two inches.

The strainer unit was installed in August and has operated almost continuously since September 1. The flow through the unit has varied from 160,000 gallons to about 20,000 gallons in 24 hours. A very good rate of flow is 70,000 gallons. Some trouble was experienced at first with the rough strainer on the raw water line becoming clogged with fish. This is the reason for the very low rates of straining at times.

The removal of micro-organisms has averaged about 75% when the raw water counts averaged about 1,500 micro-organisms per ml. The reduction in volume of micro-organisms has averaged about 80 per cent.

The reduction in turbidity has amounted to approximately 50%. Microscopical organisms help produce turbidity in the raw water, so the removal of a large percentage of such organisms lessens the turbidity. Also, the lake water contains some amorphous matter in particles large enough to be removed with the strainers.

The wash water has averaged high because it is flowing at a constant rate, and, when the raw water flow dropped off, due to clogging of the rough screen, the percentage of wash water used increased greatly. When we find a means of maintaining more uniform rates of raw water flow, the wash water use should not average greater than 10%. This, however, is a large proportion of the total water strained, and is much greater than the wash water rate used in the average rapid sand filtration plant.

Radar Detects, Tracks and Measures Rainfall

Radar methods for tracking storms and measuring rainfall have been developed by the Illinois State Water Survey and the procedures used were described in a paper before the American Society of Civil Engineers Houston meeting by Herbert E. Hudson, Glenn E. Stout and Floyd A. Huff. An outline of the storm area is reproduced by the radar and can be recorded photographically. By a slight modification of the radar the intensity of the storm area can be indicated. Radar observations coincided closely with the actual rainfall pattern established by means of a greatly intensified rain-gage network. The near side of the storm can be measured closely, but the rainfall rate measurements on the far side are subject to considerable inaccuracies.

Brush Killed By Winter Spraying

Recent tests have established that brush can be killed by spraying during the winter while dormant, according to Dow Chemical Co.

The technique, known as basal bark treatment, consists of spraying only the basal portions of brush stems or trunks to a height of 12 to 18 inches above the ground line with Esteron 245 in Diesel fuel or kerosene, using one pint of Esteron 245 to 3 gallons of oil. Late winter or early spring treatments have proved particularly effective.

The method is important to highway engineers, power companies and railroads since they can spray brush on rights-of-way when there is less danger of injuring susceptible farm crops.

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Preparation for Civil Defense

Continuation of service with a minimum of interruption in case of bombing or other emergencies requires provision for mutual aid, protection of plants and facilities, for defense against biological warfare, and temporary supply of safe water. Preparation includes bringing distribution system maps completely up to date, with records of locations of valves, hydrants etc. readily available. Cooperate with fire authorities to survey possible emergency sources of supply and prepare for using them. Cooperate with local defense authorities to integrate plans for protecting the water works with the community plans, and train volunteer workers. Study feasibility of interconnections with neighboring water systems, and make those which are thought to be advisable, being sure no dangerous cross-connections are made. If hydrants in the different cooperating systems have different threads on their hose connections, have fire trucks equipped with the necessary adapters. Eliminate bottlenecks in the distribution system. Install additional valves where needed to facilitate repairing main breaks. Locate motors, welding equipment, etc., which could be obtained for emergency use. As a protection against sabotage, have the police department check the water department personnel. Also discuss with the police the protection of important parts of the system by guards, fences and lights. Insure the provision of duplicate pumping facilities and power sources. Bacteria introduced into the water by enemy agents ahead of a filter plant will generally be removed by it; any added after filtration will be eliminated or greatly reduced by the chlorine residual. There is little probability that poisons would be introduced into a public supply in dangerous amounts. Presence of most poisons is indicated by changes in pH concentration or chlorine demand, or in floc formation time or requirements. Many warfare gases are removable by use of activated carbon, coagulation and settling. Atomic bombing probably will not affect the water in a reservoir seriously; even a burst in a large reservoir would make the water unfit for a few days only.

Earl Devendorf—"Civil Defense for Water Supplies;" *PUBLIC WORKS*, April.

Radioactivity And the Water Supply

Information was obtained firsthand by the author at Oak Ridge concerning the effects of atomic bomb bursts and how to detect and remove radioactivity. In case of an A-bomb burst similar to that in Japan, occurring 2,000 ft. above the ground on a clear day, workmen could enter the area near the destroyed sections to work for two hours at a time. Water in mains, residence hot-water tanks and covered tanks would not be rendered unsafe. Rain falling at the time of a bomb burst might make the solids in a reservoir radioactive. If water should become radioactive, this can be reduced to the necessary emergency low level by use of the regular water softening procedure but maintaining a pH of not less than 10.2, and use of copper, silver or carbon. Oklahoma City Water Dept. is purchasing two Geiger counters for monitoring areas; also a brand-new instrument which determines the emergency level of radioactivity of water.

M. B. Cunningham—"Preparing for Atomic Eventualities;" *Water & Sewage Works*, March.

Recalcining Softening Sludge

Miami, Fla., water is softened by excess lime treatment, using about 15,000 tons of lime a year. Since February, 1949, the sludge has been recalcined to obtain lime for the softening process, first passing through a thickener and a Bird centrifuge. During more than a year's operation the fuel consumption by the kiln averaged 57 gallons of fuel oil per ton of lime burned. During the fiscal year 1949-50 the total production was 17,082 tons, of which 14,992 tons were used by the Miami plant and 2,100 tons were sold to other municipalities for $21,467. The net operating cost was $6.81 per ton. Adding interest and depreciation on cost of plant, the cost was $8.73 a ton, or a total of $123,015. Had the lime used by the Miami plant been purchased, it would have cost $292,471. The net profit therefore was $169,456, or 21% of the total investment.

A. P. Black, C. F. Wertz and C. R. Henry—"Reclaiming Softening Sludge at Miami, Florida;" *Water Works Engineering*, March.

Rapid Sand Filter Designs

The success of a rapid sand filter depends as much upon proper design and construction of the underdrain system, as upon any other single factor. One that is satisfactory for backwashing will always collect the filtered water adequately. The underdrain systems in common use today include a)—header and perforated laterals; b)—these, with precast concrete block between the laterals (Wagner block); c)—vitrified tile block with orifices and water passages to take the place of laterals (Leopold bottom); d)—false bottom, precast or otherwise; flat bottom with strainers or inverted pyramid, such as the Wheeler bottom; and e)—porous plate. Of 15 cities cited by the author, 6 used perforated laterals, 4 had Wheeler bottoms, 4 had Leopold bottoms, and 1 had the Wagner.

Surface wash equipment is being used extensively. Of the 15 cities cited by the author, 8 had Palmer surface wash equipment, 2 had a header and laterals, and 1 provided for future installation. For filter media, all had gravel, the depths varying from 6″ to 24″; and 13 had sand, and 2 anthracite, the depths being 30″ in four plants, 27″ in five

plants, 24″ in five plants, and 20″ in one plant. The design filtration rates were 2 gpm/sq. ft. in 10 cities, 2.5 in 3 cities and 3 in 2 cities; with provision for rates 0.5 gpm or more in excess of the design rate, reaching a 5 gpm rate in one case.

Richard Hazen—"Elements of Filter Design;" *Journal, American Water Works Ass'n*, March.

Precise Calculation Of Pipe Capacity

The authors believe that if a waterworks engineer is aware of the distinction between partially turbulent flow and fully turbulent flow, he will be skeptical of purely empirical formulas and accept the rational type formulas. They develop such formulas, which involve the use of the Reynolds number. However, they state that an average cast-iron pipe in permanent city mains will be in full turbulence above a velocity of 0.2 fps, and seldom at non-turbulent velocities. In discussing this paper, Prof. Malcolm S. McIlroy said that precise theoretical calculation might be justified in designing a hydroelectric station penstock or a trunk connection between a remote reservoir and a city distribution system, but such precision is entirely out of place in designing a distribution system, where there is more or less limited knowledge concerning present or future takeoffs, the condition of the interior of each pipe line, the normal fluctuations of loading of individual pipelines, and the need for skeletonizing the system and for lumping loads to reduce time spent in analysis.

Harry H. Chenoweth and Robert E. Leaver—"Relative Pipe Roughness;" *Journal, American Water Ass'n*, March.

Use of Radio By Utilities

When considering the installation of a mobile radio system for use by a water department, it is wise first to obtain a copy of rules of the Federal Communications Commission from the Supt. of Documents, Washington, D. C. Before the system can be constructed, an FCC permit must be obtained and the frequency band of operation chosen. Two bands are available, the 30-50 megacycle and the 152-162; unless an operating range of more than 20-35 miles is desired, the 152-162 is recommended. Then field tests must be conducted under FCC license, and the regional committee's recommendation obtained. An application for a construction permit can then be made to FCC. When construction has been completed, station tests are made by FCC engineers, and application for an operating license can be made.

George S. Moore—"Use of Radio by Utilities;" *Journal, American Water Works Ass'n*, March.

Inhibiting Corrosion with Sodium Silicate

When sodium silicate is used to control corrosion in domestic water piping, it forms a self-healing, thin, protective film on the inside of the pipe. This would seem to be a colloidal phenomenon, involving either colloidal or ionic silica. The authors investigated the composition of extremely dilute sodium silicate solutions and their action with metals and metal corrosion products. They found that solutions of different sodium silicates in very low concentration (12-1400 ppm of SiO_2) achieve an equilibrium between ionic and colloidal silica, the rate being slower as the concentration increases. Silica is not removed from these solutions by metals until the solid corrosion products of the metals form. The siliceous film which forms on the corroding metals and inhibits

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the corrosion process is predominantly amorphous silica. The mechanism of removal of silica from the very dilute solutions of sodium silicate by zinc hydroxide is found to be adsorption (chemisorption), resulting in the formation of an adsorption compound.

Leo Lehrman and Henry L. Shuldener—"The Role of Sodium Silicate in Inhibiting Corrosion by Film Formation of Water Piping;" Journal, *American Water Works Ass'n*, March.

Ownership Of Meters

In a round table discussion of this subject by officials of 65 water works utilities, it was stated that 52 of them owned all the meters, 10 owned none, and 3 owned only the small meters; while 58 believed that all meters should be owned by the utility. The reason given for this opinion was that the utility should maintain complete and unquestioned authority over them, including the right to make replacements with other types or makes. One official said: "What does an owner want with a meter? If he has to pay for it, he has a right to remove it with his furniture from place to place." In practically all cases the utility makes all repairs, charging the cost to the consumer if they were necessitated by freezing, hot water or abuse.

"Ownership of Meters;" *Water Works Engineering*, March.

High-Rate Filtration In Rapid Sand Filters

A number of waterworks engineers discussed at some length the advisability of operating slow sand filters at rates higher than the conventional 2-gal. rate. An abstract of the opinion of each of these is given below.

"Let public health officials set the figure for coliform bacteria desired of water works, and I assure you this figure will be met at any rate of filtration the plant may choose to use." Every surface water should be filtered. If there are no disease-producing bacteria present, other materials in suspension more than justify filtration. If high-rate filtration produces turbidity as great as ¼ that of the average for much of New York City's water, it should not be considered acceptable. *John R. Baylis.*

Rates higher than 2 gpm per sq. ft. must be selected with due regard for adequate factors of safety, provisions for emergency needs and requirements for water in the future without necessitating still higher rates, and with due regard to the effectiveness of technical supervision in insuring effective pretreatment.

Testing effects of high-rate filtration in a pilot plant is recommended for each case before adopting it. . . Long experience has demonstrated that the 2-gal. rate coupled with the use of 0.40 to 0.45 mm. sand provides a factor of safety for effective clarification of even poorly pretreated water. High-rate filtration through coarse sand necessitates technical control to secure effective pretreatment. *Charles R. Cox.*

The smaller plants are not likely to have technical supervision and consequently should be made as simple and foolproof as possible. "High-rate filtration is not practical for general application, but might be considered where conditions are particularly favorable as relates to the raw water supply, reasonable assurance of skilled operation, adequate pretreatment, and where economic considerations are of moment." *H. E. Moses.*

It is suggested that the nominal capacity be based on the 2-gal. rate as satisfactory for an estimated future average annual consumption;

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but that the plant should be capable of providing safe and satisfactory water for peak demands of 3-gal. and even of 4 gal. under unusual conditions. To permit this, proper flocculating and coagulating facilities must be available and adequate chemical and bacteriological controls must be maintained. *Roy H. Ritter.*

There are too many factors involved to permit an unqualified declaration for or against. However, it can be positively stated that no reduction of rate within reason can compensate for inadequate preparation for filtration. . . There is no substitute for proper preparation for filtration, or in other words, the rate of filtration within practical limits has but little effect on the quality of the filter effluent. *Marsden C. Smith.*

"Symposium: High-Rate Filtration of Water in Rapid Sand Filters;" *Journal of Pennsylvania Water Works Operators' Ass'n* for 1950.

Behavior of Wells in Waterlogged Areas

It was noticed that in certain areas where the soil was waterlogged, trifling rainfalls caused well levels to rise out of all proportion to what could be explained in terms of the rainfall and the effective porosity of the soil. Investigation has shown the general explanation to be that, as the surface dries out, due to a very small abstraction of water, meniscuses form in the soil spaces and produce a negative pressure in the soil water, thereby lowering the surface of atmospheric pressure in the soil-water (i.e. the watertable) by an amount limited by the capillary lift of the soil. Once the limit has been reached the whole capillary fringe moves down bodily, and the well movement —previously a manometric pressure record—becomes indicative of the movement of water. When the meniscuses are still at the surface a slight sprinkling of water will destroy sufficient of them to alter the general negative pressure appreciably and cause a jump in water-table level.

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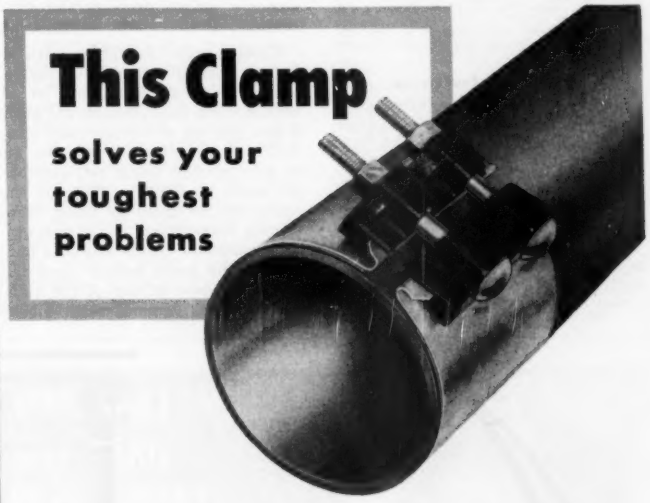

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Operating Water Works

(*Continued from page* 38)

conditioning. In addition, water unsuitable for boiler feed purposes is usually injurious to domestic hot water heaters. For moderate pressures and general uses as indicated above, water should be clear, free of non-carbonate hardness, have a total hardness not over 35 ppm and be practically free of oil, carbon dioxide, free oxygen, free acids and organic compounds. At very high boiler pressures, silica scale becomes a serious problem and silica removal is necessary or desirable.

Cooling water should be relatively cool, without sediment, corrosiveness or high algae content. In air conditioning, requirements are about 8 gpm per ton of refrigeration using cool well water and 2 gpm per ton of refrigeration using refrigerators. As much as 90% to 95% of this water can be saved by using evaporative condensers. Small evaporative coolers for rooms may be a burden on the water supply since this demand comes on top of the usual summer peak demand. Such coolers may use as much as ¼ pm or 360 gals. per day.

Ice manufacture requires water free of sediment, iron, manganese, tastes, odors and bacteria, and low in mineral content. Calcium and magnesium bicarbonates form gritty and discolored deposits in the ice block; iron oxides cause discoloration; sodium and calcium chlorides and sulphates cause white butts and retard freezing, but do not form deposits. If the water contains less than 171 ppm total dissolved solids, excluding suspended matters, less than 70 ppm of combined bicarbonates of calcium and magnesium and less than 0.2 ppm of iron, first quality ice can be made without providing any treatment for the water.

For carbonated drinks, water must have a low bacterial count. The syrups used and the storage period provide a good bacterial growth media. Turbidity should be less than 1.0 ppm; and the water should be colorless, tasteless, odorless and free from organic matter and algae. Hardness should be less than 200 ppm. For brewing, water should have the same qualities as for carbonated drinks, and also a

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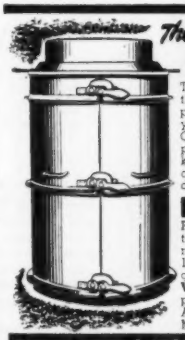

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pH of about 7, a minimum of carbonate hardness, below 275 ppm in sodium chloride, and a content of 400 to 500 ppm of calcium sulphate.

Also included in this section are desirable qualities for water for food and drug products, paper and textile manufacturing and laundering. D. W. Robinson, Water and Gas Superintendent, Community Public Service Company, Fort Worth, Texas, prepared this chapter of the manual.

Safety Measures

Guarding against accidents should not be confined to routine operations but should include unusual and infrequent jobs such as extending mains, repairing and maintaining equipment and meeting emergencies. In planning safety measures, considerations should be given to (1) occupational health hazards and (2) occupational accidents. The first are due to prolonged exposure to small amounts of dusts, gas or vapors; the second includes such factors as falls, electrical shock and equipment breakdown.

Poisonous gases include chlorine, ammonia, ozone, nitrogen dioxide, phosgene and hydrogen sulphide. Asphyxiant gases include carbon monoxide, methane, nitrogen and even air with considerable oxygen deficiency. Protective measures against these include the isolation or elimination of the source of gas, adequate general or local ventilation and the use of personal protective devices, such as respirators or masks. The correct canister should be used and for water plants it is better to provide the so-called universal canister. Canister masks, however, are not safe for gas concentrations greater than 2% by volume or where an oxygen deficiency exists. The hose mask, with fresh air supplied by an outside blower, is one of the safest types.

Solvents are not usually serious hazards in water works but caution should always be employed when using gasoline, methyl alcohol, carbon tetrachloride, turpentine and lacquers. Chemical cartridge respirators may be useful in atmospheres containing solvents.

Heavy metal fumes, as in welding galvanized or lead painted surfaces, may be dangerous but can be corrected by adequate ventilation. Dusts exist in great variety in a water plant, including lime and soda ash, both relatively harmless; quicklime dust and hypochlorite dusts. The plant design should be such as to eliminate dust or adequate ventilation should be provided, supplemented by personal dust filters.

An important part of any safety program is thorough plant inspection. This should include (1) fire hazards, such as oily rags and flammable liquids; (2) fire protection, such as extinguishers, alarms and escape provisions, (3) yard conditions, including excavation and pipe storage areas; (4) winter hazards, slippery walks and steps, and snow obscured objects; (5) electrical equipment, grounding, rubber mats and proper insulation; (6) unguarded belts, pulleys and moving parts; (7) material handling, as slings, conveyors, hoists and trucks; (8) chemical hazards from gases, acids, vapors and mists; (9) lighting adequacy on stairways and at manholes and openings; (10) housekeeping, including stairs and steps free from encumbrances, emergency exits kept clean and floors clean of oil.

Much more excellent information is presented in the section which was prepared by M. C. Wukasch, Senior Engineer, and Fred Venable, Engineer, of the Texas State Department of Health.

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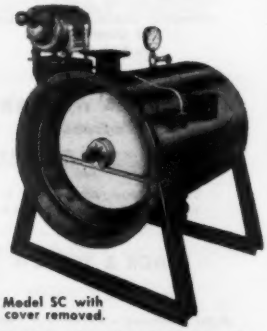

Model SC with cover removed.

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State Fair Fly Control

(*Continued from page 45*)

clerestories. Residual applications on window panes and panels in these areas are very effective and in some buildings are the only places that are satisfactory for insecticide application. Buildings constructed principally of concrete provide very little area that is suitable for insecticide residuals. Presumably, the concrete inactivates any of the residual insecticides used. Buildings fenced with wire and containing many cages such as the poultry building lend themselves to residual insecticide application. During the four years of fly-control work, flies were never noted in the poultry building.

(9) There is a need for better information on fly habits and for an easier method of locating larvae sources.

(10) The Public Health Service Scudder grill was not satisfactory in many locations because the degree of control desired was below that measurable by the grill method. Fly station and area counts supplemented by detailed surveys of specific problems provided satisfactory entomological control.

Organization

In 1947, the Illinois Department of Public Health financed and operated the entire fly-control program. After that a gradual shifting of responsibility was made until 1950 when the Department of Public Health furnished only technical information and entomological control and data. All of the actual fly-control work was effected by the Illinois State Department of Agriculture, Division of State Fair. Future improvements indicated include: (1) Sanitary control of vehicles bringing livestock to the fairgrounds should be effected by assigning men to each truck to make sure that they are cleaned immediately after livestock is unloaded; (2) adjacent sources of flies should be eliminated by institution of sanitary practices; (3) the program should work toward more economical and even more effective methods of control.

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How Engineers May Apply for Commissions

To be eligible for a commission in the Public Health Service as a Sanitary Engineer, the applicant must be a graduate of an engineering school of recognized standing preferably in sanitary, civil or chemical engineering and must be physically qualified. Each candidate whose application is accepted will be required to have an oral interview with a Public Health Service officer and be physically examined at the nearest Public Health Service medical facility. If he is a candidate for an active Reserve Corps commission in the grade of Junior Assistant Sanitary Engineer (Ensign) or Assistant Sanitary Engineer (Lieutenant, Junior Grade) he will be required to take a brief written professional examination.

At the present time vacancies, which may be filled by Reserve Corps appointments, exist for recent engineering graduates and experienced engineers for assignment to public health missions to foreign countries and to current programs in the United States and Alaska. In addition to a limited number of appointments in the grade of Junior Assistant Sanitary Engineer (Ensign), appointments may be made in the grades from Assistant Sanitary Engineer (Lieutenant, Junior Grade) to Senior Sanitary Engineer (Commander) depending upon the qualifications of the candidate. Graduation from an engineering school is required for appointment to the grade of Junior Assistant Sanitary Engineer. Additional professional training and/or experience of three, six, thirteen and twenty years respectively are required for appointment to the higher grades from Assistant Sanitary Engineer to Senior Sanitary Engineer. Foreign duty assignments are available in Southeast Asia, the Near East and Africa with provision for dependent family members in most countries. Vacancies in the United States and Alaska are available in programs of sanitary engineering research, water pollution control and general sanitary engineering.

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Application forms and additional information may be obtained by writing to the Surgeon General, U. S. Public Health Service, Washington 25, D. C., attention, Division of Commissioned Officers. Application forms may also be secured from Public Health Service Regional Engineers who are located in Federal Security Agency Regional Offices in Boston, New York, Washington, Atlanta, Cleveland, Chicago, Kansas City, Dallas, Denver and San Francisco. The Regional Engineers can also provide information concerning program activities in the Public Health Service and the need for engineering personnel.

Hackensack Parking

(*Continued from page 42*)

The engineers applied their recommended schedule of parking rates to the estimate of use of the proposed facilities and estimated that the nine recommended parking fields will produce $104,250 in gross revenues for their first year of operation, assumed to be 1952. For the first 10 years of operation of the proposed parking program the average annual gross revenues are estimated to be as follows:

1952	$104,250	1957	$130,510
1953	109,480	1958	133,120
1954	114,930	1959	135,780
1955	120,680	1960	138,500
1956	126,710	1961	139,890

Over the first 10 years of operation, the average annual gross revenues of these fields is estimated to be $125,400 and the average annual gross revenue over the period of the bond issue is estimated to be $134,900,000. The engineers add: "This estimate of revenue is conservative and in keeping with present economic conditions.. They are meant to indicate a trend over the years rather than gross earnings which might occur in any year."

The annual cost of maintenance and operation for the nine lots is estimated to be $25,400. This includes the cost of policing, meters, and lighting.

Dominick Fondo, counsel to the City Parking Authority, sent this memo to the City Council to summarize the proceedings:

"Since, as a general proposition, there are little statistics for parking revenue bonds and, in the case of Hackensack, of course no previous experience, the fiscal agent of the Authority, who has been consulted in reference to the proposed sale of bonds which will be necessary to

finance the project, has recommended that the Authority issue and sell its bonds and, upon completion of the project, the same will be leased to the City of Hackensack for the term of the bonds and for an annual rental to guarantee the interest and amortization of the bonds. The Authority will act as the operating agent for the City under the lease and the revenues will comprise anticipated revenue of the City to offset the rental charge. In this fashion the bonds, those of the Authority, will not be included in the City's debt, but because of the lease guarantee, will be marketable at an interest rate relative to that earned on the City's bonds rather than the much higher rate which would be required to induce the purchase of bonds of an independent authority and which would otherwise not be secured by the taxing power of the municipality."

Hackensack is the County seat in Bergen County, N. J., and is considered one of the livest retail markets. Merchandisers in many parts of the nation are watching with interest the effects of the parking program on what is already big business there.

Tacoma Water

(*Continued from page* 33)

the pipes intolerable. After welding, the pipe joints were smoothed down with motor buffers and the seams heavily tarred.

A Worthington 60 Blue Brute air compressor was employed to force air into one section of the pipe line being worked on, while another sucker pump pulled hot air out the other end, thus enabling welders to remain inside the pipes while welding the joints.

The Northwest dragline shovel was also used for scooping the windrows of fill-sand back into the trench to cover up the pipe line. At intervals along the line, manholes were constructed of concrete bricks in cement mortar to allow future servicing of the line area. A small, portable one-sack Jaeger cement mixer was employed for cementing operations.

Responsible for the new industrial pipe line was J. S. Roberts, Commissioner of Public Works for Tacoma and W. A. Kunigk, Supt. of the water department. In direct charge of the project for the city was J. A. Kuehl, while Supt. L. H. McElroy directed the job for the Urban Plumbing Co.

GET READY FOR CIVIL DEFENSE with MOBIL-SWEEPER

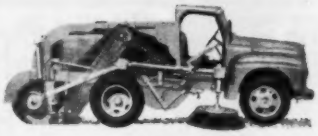
1
For decontamination of stricken areas, Mobil-Sweeper can scour miles of pavement, spraying 200 gallons of decontamination solutions per trip.

2
Keeping roads open and in usable condition is essential. Roads must be swept clean of debris injurious to tires.

3
Mobil-Sweeper's 55 m.p.h. speed permits it to make fast emergency trips or travel in military convoys to stricken areas. No other sweeper is as adaptable for emergency use nor as safe.

GETS STREETS CLEANER . . . AT LOWER COST

You can balance your street cleaning budget through the greater efficiency of a Mobil-Sweeper. Ten years of development bring you unsurpassed sweeping action. The longer draught arms on the rear pickup broom are "full-floating" in the true sense. Deepest dips get a clean sweep where ordinary sweepers would skip over refuse. You get a more thorough job on gutters because Mobil-Sweeper employs the "Decreased Arc" type gutter broom segment that retains its flipping action and gives hundreds of extra miles of clean sweeping. The 200-gallon water tank saves on stops for refills. *Don't be fooled on dirt hopper capacity* . . . be sure that your sweeper fills to its rated capacity every time under normal operating conditions. Mobil-Sweeper fills its 2⅔ cu. yd. hopper to the overflow every time—that's what counts. The powerful International Harvester engine lends itself to your standard type maintenance. Your operator is safer in Mobil-Sweeper with its shatterproof windshield, steel cab and 4-wheel hydraulic brakes. Write for details on how your community can save on street sweeping costs.



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DIVISION OF THE CONVEYOR CO.
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THE CONVEYOR COMPANY
3260 East Slauson Avenue, Los Angeles 58, Calif. PW-6
Gentlemen:
Please send catalog with complete details and specifications for the Mobil-Sweeper.
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Now's the time to mail this month's Readers' Service card.

PUBLIC WORKS EQUIPMENT *News*

Better Light for Colorimetric Comparators

A new "Daylite" illuminator for Hellige pocket and standard comparators provides the most suitable

"Daylite" illuminator.

light for colorimetric work and insures reproducible results independent of the time or weather. This illuminator uses a special bulb which is located in a ventilated metal housing about 4 ins. square and deep. Furnished for AC or DC. Full information from Hellige, Inc., 3719 Northern Boulevard, Long Island City 1, N. Y., or by using the coupon.

Use coupon on page 85; circle No. 5-1

Saw for Cutting Concrete and Blacktop

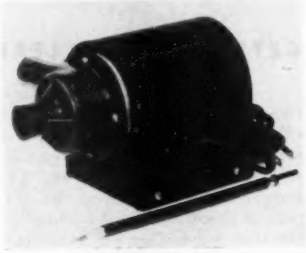
It is said that this machine, which is powered with a 13.3 hp gasoline motor, will saw concrete and asphalt streets, concrete floors, airport runways, etc., assuring a smooth and straight edge for patching. It can also be used for sawing contraction and expansion joint openings, grooving for crack control and grooving ramps and steps for safety. Information on this and on the "Concut" saw is available from Concrete Sawing Equipment, Inc., 15 N. Oakland St., Pasadena 1, Calif., or by using the coupon.

Cuts concrete and asphalt.

Use coupon on page 85; circle No. 5-2

Small All-Rubber Pumps for Many Jobs

Small rubber centrifugal pumps, for handling both corrosive and noncorrosive liquids, are powered by



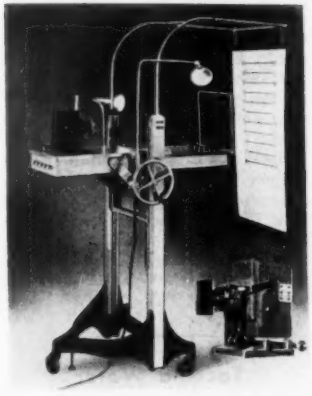
All-rubber centrifugal.

electric motors of 1/200 to 1/35 hp. The pumps weigh from 2 to 4 pounds. Capacity ranges from 504 gph at 2-ft. head to 78 gph at 10-ft. head. Information and specifications from Gorman-Rupp Co., Mansfield, Ohio, or by using the coupon.

Use coupon on page 85; circle No. 5-3

Identification Equipment for Plant Protection

No photographic skill is required to operate this identification unit. Focus, lighting and exposure are standardized. As a result, this is one of the important answers to the photographic identification of employees and visitors. Mounting is on rubber casters for easy movement.



Helps protect installations.

Pictures are on 35 mm film and photos cost less than 2 cents each. The scaled background permits incorporating height data in the photograph. This machine can also be used for making copies of correspondence, drawings and other records. It is especially useful for small organizations as a substitute for microfilm work. More information can be obtained from Technical Service Dep't., Graflex, Inc., Rochester 8, N. Y.

Use coupon on page 85; circle No. 5-4

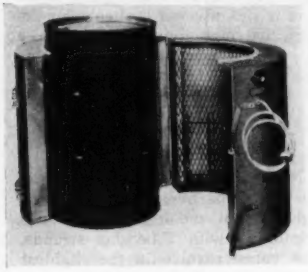
Picks Up Cigarette Butts and Pop Bottles

This power sweeper is claimed to be able to pick up everything from cigarette butts to pop bottles in one operation. The driver has 100% visibility, permitting him to work with maximum speed. The sweeper is recommended for cleaning streets, parks, driveways, playgrounds, parking lots and alleys. For information on this sweeper, the Model 1000-M, write Wilshire Power Sweeper Co., Glendale 4, Calif., or use the coupon.

Use coupon on page 85; circle No. 5-5

How to Warm Up Cold Drums of Oil, Grease or Tar

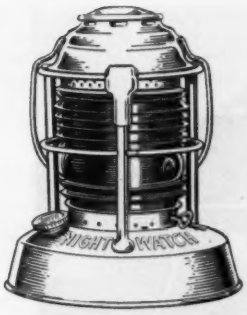
In cold weather, and sometimes in warm, it is important to warm metal drums containing tar, asphalt, grease,



Warms up cold drums.

oil or other materials. This drum warmer will heat "anything in metal drums up to 400°F." Designed for the standard 55-gal. drum, heating is by electricity and thermostats control the temperature or hold it at a desired level. Full information from Harold L. Palmer Co., 6432 Cass Ave., Detroit 2, Mich., or by using the coupon.

Use coupon on page 85; circle No. 5-6



Pencil beam signal lantern.

Safety Lantern with Pencil Beam Signal

Because of the intensifying power of the globe used in this lantern, only a small wick is required and this lantern will burn 100 hours on a single 16 ounces of kerosene—one filling. The fresnel globe is designed to concentrate the light rays and project them into a straight line beam. A circular is available from R. E. Dietz Co., Syracuse, N. Y., or by using the coupon.

Use coupon on page 85; circle No. 5-7

Cuts and Shreds Weeds and Brush

This mower is claimed to be able to cut a clean swath 6 ft. 8 ins. wide through heavy weeds and brush.

Toro Whirlwind mower.

Clippings are finely shredded and scattered, eliminating the need for raking and adding to soil values. It is possible to mow right up to fences. Blades are protected by shear bolts if rocks are hit. Suction lift blades raise low-lying grass. Height of cut is from ground level to 14 ins. Excellent folder from Toro Mfg. Corp., Minneapolis 6, Minn., or by using the coupon.

Use coupon on page 85; circle No. 5-8

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Hydrauger Corp., Ltd.
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Please send, without obligation to me, the HYDRAUGER BOOKLET which shows relative costs and speeds of BORING as well as specifications of various Hydrauger models.

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AVOIDS EXCESSIVE TRENCHING

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HYDRA-HAMMER *and* ONE MAN REPLACES ALL THESE!

Asphalt Cutting
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REPLACES:
3 men each using a $300 jackhammer
$4700 compressor for jackhammers
$2900 tow truck and driver
or
$3800 breaker and operator
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Save time and money on labor and equipment with the revolutionary Ottawa Self-Propelled Hydra-Hammer. No skilled operators needed for this multi-purpose tool, any man able to drive a truck can learn to operate the Hydra-Hammer in an hour.

The Hydra-Hammer travels under its own power up to 12 MPH. Converts from travel to work position by elevating the tower and shifting gears. No extra engine or hose couplings to slow production. The 400 pound hammer falls free, eliminating shock and high maintenance costs.

Write today for descriptive booklet . . . see how you can reap profits from the amazing Self-Propelled Hydra Hammer!

Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS, U.S.A.

Compacts trenches to depths of 25 inches.

How to Compact Trenches Better

With sufficient clearance to permit working to depths of 25 ins., this roller has the following features: Hydraulic mechanism to operate the steerling wheels which ride on the pavement; hydraulically controlled leveling wheels; and extra-large diameter variable weight compression roll. Compacting effect varies from 310 lbs. per lineal inch of roll width to 370 lbs. with roll ballasted. Complete information from Galion Iron Works & Mfg. Co., Galion, O., or by using the coupon.

Use coupon on page 85; circle No. 5-9

Throwing That Snow Where You Want It to Go

When large spaces, considerable distances or congested areas must be cleared of snow quickly, a rotary snow plow is used. To facilitate the control of the snow stream from these rotaries, hydraulically controlled revolving casting chutes have been developed which permit discharge in any direction, and from one or two nozzles. These can be installed on some rotary plows already in use. Especially good for airport clearing. Information on these chutes is available from Wm. Bros Boiler & Mfg. Co., Minneapolis 14, Minn., or by using the coupon.

Use coupon on page 85; circle No. 5-10

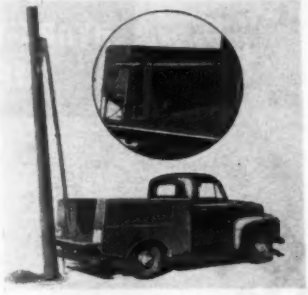
Steel Forms for Concrete Bomb Shelters

It is believed that a concrete shell covered with a minimum of 2 ft. of earth on top, and reinforced with sand bags, affords maximum bomb protection. There should be two exits and several openings for ventilation. Steel forms are available for such construction in any desired size. Detailed information is available from Concrete Forms Corp., Irvington, New York, or by using the coupon.

Use coupon on page 85; circle No. 5-11

Telescopic Single Leg Derrick for Small Trucks

This derrick is for installation on ½, ¾ and 1-ton trucks. When not in use, the boom is stowed in a telescoped position along the body side panel where it does not interfere. Maximum lift is 1500 pounds. The base is keyed to permit positioning the boom at two angles of elevation; and the upper section of the boom may be telescoped for greater capacity when maximum height is not required. Data from McCabe-Powers Auto Body Co., 5900 N. Broadway, St. Louis 15, Mo., or by using the coupon.



Derrick for small trucks.

Use coupon on page 85; circle No. 5-12

Easier Sidewalk Repair and Maintenance

Sidewalk repair can now be bought by the barrel, so to speak. This resurfacing material for all kinds of sidewalk repair and reconstruction comes in a plywood barrel which contains the exact amount of bond, graded aggregate, bituminous paste and setting powder. All you do is add water and follow the directions. Sets in 24 to 36 hours and is not affected by heat or cold. Descriptive bulletin from Monroe Co., Inc., 10703 Quebec Ave., Cleveland, O., or by using the coupon.

Use coupon on page 85; circle No. 5-13

Fiberglas Plastic Sign for Construction Crews

Now in use by Toledo's Municipal Service Department, this sign has light weight molded plastic vanes reinforced with Fiberglas strands. The vanes revolve in the slightest breeze, providing ample warning.

Better warning sign.

The signs will not tip over in a high wind; they do not employ steel; and they have been found effective in protecting construction crews. Full information from Roto-Signal, Inc., Brecksville, O., or by using the coupon.

Use coupon on page 85; circle No. 5-14

Root Resistant Plastic Pipe Joint Compound

G-K 58 is a new pipe jointing compound, root resistant, of the hot-melt type, with superior adhesion to both wet and dry vitrified clay pipes. It is of interest to note that this new jointing material was announced on the 58th anniversary of the founding of this firm. For fuller data, write Atlas Mineral Products Co., Mertztown, Pa., or use the coupon.

Use coupon on page 85; circle No. 5-15

Pocket-Size pH Meter

Like a camera, this small instrument comes in a compact case, complete with tubes and solutions. The meter is about 3 by 6 by 2 inches. Total weight is 3 lbs. The scale is from 2 to 12 pH and an accuracy of 0.1 is said to be obtainable.

Pocket-size pH meter.

Batteries provide up to 1300 hours of operation. Its use can eliminate many trips to the laboratory. Full information and complete description from Analytical Measurements, Inc., 585 Main St., Chatham, N. J., or by using the coupon.

Use coupon on page 85; circle No. 5-16

Engineers Needed

The Military Air Transport Service needs sanitary engineers, civil engineers, and professionally trained men in other fields. Starting salaries range from $5400 to $6400. For information, write Civilian Personnel Officer, Andrews AFB, Washington 25, D. C.

NOTICE TO BIDDERS

Sealed bids will be received until 9:00 a.m. EST May 21 A. D., 1951, in the office of City Auditor and Clerk for New Filter Equipment at Water Treatment Plant, Fort Lauderdale, Fla.

Bidding blanks may be obtained from the office of the Engineers. Plans and specifications are on file in the office of the Engineer.

A deposit of $25.00 for plans and specifications and of $15.00 each for additional copies of plans or specifications will be required. All deposits for plans and specifications will be refunded upon their return in good condition within ten (10) days of the opening of bids.

A certified check for 5% of the total amount of the bid, made payable to:

City of Fort Lauderdale, Florida

shall accompany each proposal as evidence of good faith and responsibility of the bidder. This check shall be retained by the payee as liquidated damages should the bidder refuse or fail to enter into a contract with the payee for the execution of the work embraced in the proposal, in the event the proposal of the bidder is accepted.

The Owner reserves the right to reject any or all bids.

F. D. Rankins
City Manager

NOTICE TO BIDDERS

Sealed bids will be received until 9:00 a.m. EST May 21 A.D., 1951, in the office of City Auditor and Clerk for: High Lift pumps at Water Treatment Plant, Fort Lauderdale, Florida.

Bidding blanks may be obtained from the office of the Engineers. Plans and specifications are on file in the office of the Engineer.

A deposit of $25.00 for plans and specifications and $15.00 each for additional copies or plans or specifications will be required. All deposits for plans and specifications will be refunded upon their return in good condition within ten (10) days of the opening of bids.

A certified check for 5% of the total amount of the bid, made payable to

City of Fort Lauderdale, Florida

shall accompany each proposal as evidence of good faith and responsibility of the bidder. This check shall be retained by the payee as liquidated damages should the bidder refuse or fail to enter into a contract with the payee for the execution of the work embraced in the proposal, in the event the proposal of the bidder is accepted.

The Owner reserves the right to reject any the City Engineer, and copies thereof may be on all bids.

F. D. Rankins
City Manager

NOTICE TO CONTRACTORS

Sealed bids will be received until 9:00 A.M., May 21, 1951 A.D. in the office of the City Auditor and Clerk of Fort Lauderdale, Florida for an Elevated Water Tank for the Waterworks System.

This work involves the installation of one (1) 500,0000 gallon elevated steel water tank of tubular construction. Alternate bids will be considered for one (1) 500,000 gallon reinforced concrete elevated water tank.

Bidding blanks may be obtained from the office of the City Engineer. Plans and Specifications for the work are on file in the office of obtained at the office of the City Clerk upon payment of $25.00 for each set. Any bidder, upon returning such set promptly and in good condition, will be refunded his payment; and any non-bidder upon so returning his set, will be refunded $15.00.

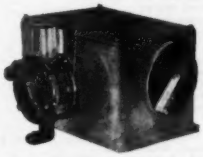
A certified check for 5% of the bid, made payable to the City of Fort Lauderdale, Florida, shall accompany each proposal as evidence of good faith and responsibility of the bidder. This check shall be retained by the City of Fort Lauderdale as liquidated damages, should the bidder fail or refuse to enter into a contract with the City of Fort Lauderdale for the execution of the work embraced in the proposal, in the event the proposal of the bidder be accepted.

The City of Fort Lauderdale reserves the right to reject any or all bids.

F. D. Rankins
City Manager

PRECISION CHLORINATING PUMPS

Positive displacement-plunger type pumps for



- Chlorinating water and waste
- Treating water with sodium flouride
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Dial adjustment provides accurate control over amount of solution being pumped. Available either with electric motor included or as a belt-driven unit.

PRECISION MACHINE CO.

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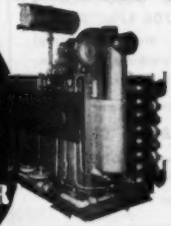
P.F.T. DIGESTER HEATER AND HEAT EXCHANGER



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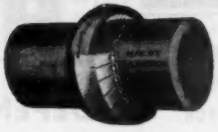
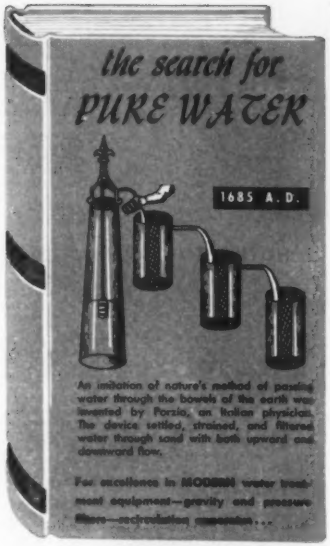
PLAN BETTER SEWER LINES



WITH WESTON GASKETS and FORMS for ALL SEWER PIPE JOINTS

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON CO. Adams Mass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PURE WATER
1685 A. D.
An imitation of nature's method of passing water through the bowels of the earth was invented by Porzio, an Italian physician. The device settled, strained, and filtered water through sand with both upward and downward flow.
For excellence in MODERN water treatment equipment—gravity and pressure filters—recirculation apparatus...

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

ROBERTS FILTER MFG. CO.
640 Columbia Ave.
Darby, Pa.

2—NEW 400 H.P. WESTINGHOUSE MOTORS 2200 Volt 3 phase, 60 cycle, 708 RPM, Squirrel Cage induction motors vertical solid shaft. Weatherproof construction including thermoguards.

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How You Can Dispose Of Sewage Solids

54. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Dept. PW, Nichols Engineering and Research Corp. 70 Pine St., New York 5, N. Y.

Standard Forms for Concrete Pipe

67. Concrete pipe for sewerage, drainage and culvert projects can be produced quickly and uniformly with Quinn Standard concrete forms. Data on forms for 12" to 96" tongue and groove or bell and reinforced pipe from Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

Odorless Sanitary Septic Tank Cleaning

88. The Gorman-Rupp Odorless Sanitary Cleaning unit combines centrifugal self-priming pump, air-cooled engine and oval tank on a sturdy frame. For full description of this adaptable unit get bulletin 7-ST-11. Gorman-Rupp Co., 120 N. Bowman Ave., Mansfield, Ohio.

Using Sewage Sludge Gas For Power Generation

90. Faribanks-Morse dual fuel engines can operate on either sludge gas or oil to provide steady power output despite fluctuations in gas supply. Bulletins are available on several sizes to meet your needs. Write, giving exact requirements to Fairbanks, Morse & Co., Dept. PW, 600 So. Michigan Ave., Chicago 5, Ill., or use handy coupon.

Comminutors for Automatic Disposal of Coarse Sewage Solids

152. The problems connected with disposal of coarse sewage solids are eliminated by clean, odorless, automatic Comminutors. Full engineering data show the proper model for every size plant and furnish details of hydraulics and typical installations. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Complete Bulletin on Municipal Supplies

178. Everything from leak locators to street signs is listed in the big bulletin on "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included in this handy booklet. Get a copy for ready references on all municipal supplies from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-B116. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Pump and Machinery Corp., Harrison, N. J.

Tractor-Mounted Backhoe Simplifies Digging Operations

238. Be sure to investigate the new Henry Backhoe to cut digging costs on laterals, footings, septic tanks, graves. Easily attached to your tractor. Get full data from Henry Mfg. Co., Dept. PW-551, Box 720, Topeka, Kansas, by using coupon.

How Sewer Departments Clean Catch Basins Faster

245. Cities using Hydrocranes for catch basin cleaning report better, faster, cleaner jobs. Additional excavation jobs keep these versatile units busy. Send for full data today by using coupon. Bucyrus-Erie Hydrocrane Div., So. Milwaukee, Wis.

Data on Design of Grit Collectors and Washers

202. Grit collection and separation of organic materials from settled grit is described in Link-Belt Bulletin 1942. Typical installations are shown, and design data is provided, together with specifications. Use coupon for copy, or write Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-R-13 gives details. Roots-Connersville Blower Corp., 510 Poplar Ave., Connersville, Ind.

REFUSE COLLECTION AND DISPOSAL

20 Questions and Answers On Sanitary Landfill

75. The advantages of sanitary landfill, factors in site selection, kind and size of equipment needed, capacity of a given site and other important engineering considerations are discussed in Form 1084 prepared by the Tracksson Co., Dept. PW-5, Milwaukee 1, Wis. Check the coupon for complete information on this refuse disposal method.

Investigate This Plan For Garbage Elimination

164. A new presentation, written especially for municipal officials, offers a modern solution for the garbage disposal problem. Be sure you have this up-to-date information on the elimination of city garbage collection by the use of Hotpoint Disposall units. Check the coupon now. Hotpoint Disposall Department, 5600 West Taylor St., Chicago 44, Ill.

Efficient Material Handling to Reduce Incineration Costs

130. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa.

Save Garbage Collection In Defense Housing

232. Defense housing projects won't drain manpower garbage collection when Westinghouse Waste-Away Food Waste Disposers are installed in each kitchen. Helpful information for community planners is offered by Westinghouse Electric Corp., Electric Appliance Div., Mansfield, Ohio. Just check the coupon.

City-Wide Planning for Dual Waste Disposal

243. You can get full details on the General Electric "Disposall" plan for garbage elimination by converting food wastes to sewage. Learn how Jasper, Ind., eliminated garbage cans and collection nuisance with electrical disposal units by checking handy coupon. General Electric Co., Bridgeport 2, Conn.

CONSTRUCTION EQUIPMENT

Your Dump Truck As a Complete Working Unit

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

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45. Automotive Hydra-Shovel digs 15 ft. above, 15 in. below grade, features independent hydraulic hoist and crowd action. Capacities 1 cu. yd. for digging solid earth, 1¼, 1½ and 2 cu. yd. for loading all types material. Get information from Dempster Brothers, Inc., 951 Dempster Bldg., Knoxville 17, Tenn.

Handy Catalog Covers Complete Tractor and Grader Line

70. A new 20-page booklet in a handy pocket size features Allis-Chalmers complete industrial tractor line. The importance of wise buying and fitting the equipment to the job is emphasized. Don't miss your copy. Use coupon today. Allis-Chalmers Mfg. Co., Tractor Div., Box 512, Milwaukee, Wis.

52-Page Data-Packed Bulletin On Contractors' Pumps

95. Tables for pump size determination on every excavation job, pipe friction loss, attitude effects and lots of other valuable data are included in this comprehensive booklet illustrating the many Jaeger "sure-prime" pump applications. Get your copy (catalog P45) by checking our coupon or writing the Jaeger Machine Co., Dept. PW, Columbus 16, Ohio.

Bucket Loaders for All Materials Handling

132. Wheel- or crawler-mounted bucket loaders, 3 to 4 cym capacities are described in Form 501 issued by N. P. Nelson Iron Works, Inc., Clifton, N. J. Use the coupon today for full data on these versatile machines.

Proper Garage Ventilation Aids Equipment Maintenance

156. Cold months hamper motor maintenance in closed buildings unless proper ventilation is available. It will pay you to investigate the "National" garage ventilation systems for conveninent removal of exhaust gases. Both underfloor and overhead designs are shown in detail in new bulletin. Use coupon or write to National Systems of Garage Ventilation, Inc., Dept. 16-A, 318 N. Church St., Decatur, Ill.

Check "Gunite" Concrete For Every Application

158. Big 44-page book illustrates "Gunite" uses for both repair and new construction of sewers, tanks, dams, swimming pools, and all concrete structures. A multitude of applications. Be sure to check coupon or write Pressure Concrete Co., Dept. PW, 315 S. Court St., Florence, Ala.

Combination Overhead And Front-End Shovel

194. The "Lodover", described in Bulletin LO 200, is a combination overhead and front-end shovel for International T-9 and TD-9 tractors. By digging in front, swinging load overhead and dumping to the rear, extra yards are handled every hour. Regular front-end loading is not impeded in any way. Service Supply Corporation, Philadelphia 32, Pa. Check handy coupon.

Helpful "How To Use" Section Aids Roller Selection

195. In addition to specification and illustrations of roller operation, the new Buffalo-Springfield catalog features a special section to help in the selection of the right roller model for the job. Be sure you get top results from your roller selection by checking this helpful material. Use the coupon for a copy. Buffalo-Springfield Roller Co., Springfield, Ohio.

Versatile Wheeled Tractor Handles Countless Jobs

204. A new booklet on industrial wheeled tractors recently published by The Oliver Corp. covers the complete Oliver line. Many application photos show use of tractors with matched allied equipment such as bucket loaders, maintainers, plows, mowers, brooms, etc. Get this bulletin, Form A-918, from The Oliver Corp., 19300 Euclid Ave., Cleveland 17, Ohio.

Power You Already Have Used for Digging, Trenching

228. Power takeoff of your tractor, Jeep or truck runs the hydraulically operated Hopto digger. Backhoe digs 9 ft. deep; shovel bucket has ¼-yd. capacity. Both swing full 180°. More details from Badger Machine Co., Dept. P, Winona, Minn., by using coupon.

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251. The Ottawa Hydra-Hammer is a multi-purpose tool, ready to save time on pavement breaking, patch removal, post driving and pulling. Hydraulic power handles 400-lb. hammer, gives operator perfect control. Tows behind any car or truck. Ottawa Steel Products, Inc., Ottawa, Kans. Check coupon for full details.

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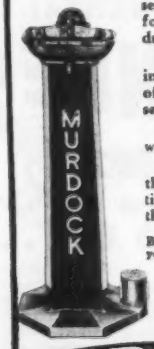

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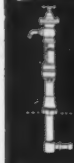

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WORTH TELLING . . .

by Arthur K. Akers

★ One of the satisfactions of column conducting: watching the young men one knows go up and stay up. Now it is **John R. Hartley,** elected a vice president of **Builders-Providence Inc.** He will also continue in charge of Engineered Project Sales in the water and sewage fields. Also in the Builders group we find **A. A. Melnychuk** joining **Omega Machine Company** as project engineer for chemical feeding problems.

Mr. Hartley

Mr. McDonnell

★ **R. E. McDonnell,** after 53 years of continuous, active consulting engineering practice as senior member of **Burns and McDonnell,** Kansas City, is undertaking the semi-impossible for him: he retired on April 2nd to take things a bit easier. It took a special booklet to recount all that led up to this, a booklet that we rate as a large chapter in the Building of a Better America.

★ **Baldwin - Lima - Hamilton Corporation** announces purchase of **Austin-Western Company,** Aurora, Ill., which will, however, continue to operate under its own name.

★ We gradually cease to be surprised at the places where we read about our own **Col. "Bill" Hardenbergh.** Latest was when we opened our March 24th NEW YORKER Magazine and found a story on him as director of the rodent control coordinating unit of the City of New York. Four-legged rats, that is.

★ **Grant A. Colton** is now president of **Golden - Anderson Valve Specialty Company,** Pittsburgh; upped from vice president and general manager.

★ Less than twelve months after 300 acres of unimproved land near Joliet, Ill., were acquired, **Caterpillar Tractor Company** produced its first scraper in a new plant still under construction. Does Joe Stalin really think he could lick a country where "decadent capitalism" can do things like this?

★ **Joseph P. Lawlor,** president of **General Filter Company,** a **Layne & Bowler affiliate,** at Ames, Iowa, sends us a beautiful booklet on Layne Water Conditioning that we are sure he will be glad to share with you on request.

★ For the tenth consecutive year, **W. E. Robinson** has been re-elected president of **The Robinson Clay Product Company,** Akron, Ohio.

★ Cartoon caption in COLLIER'S: "Just remember you're crowding sixty—no matter what any blonde tells you."

Ready to keep New York City cleaner—IHC trucks.

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CONCRETE PRESSURE PIPE

More than anyone else, those responsible for supplying water for domestic or industrial use appreciate the value of pipe lines which provide these four freedoms:

Freedom from:

- ★ Rupture or blow-out
- ★ Maintenance and repairs
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- ★ Corrosion or deterioration

The water works man who installs Lock Joint Concrete Pressure Pipe will have trouble-free pipe lines. The careful design of Lock Joint Pressure Pipe does not permit blow-out or rupture; its dense concrete walls are immune to tuberculation, corrosion or electrolytic attack; and its useful life has been estimated by competent hydraulic engineers at more than 100 years. Among Lock Joint's strongest supporters are the water works officials who have installed this type of pipe and who point to it as the most economical in their systems.

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If you are quality minded yet cost conscious, specify Lock Joint Pressure Pipe, secure in the knowledge that you are receiving the best value the pipe industry can provide.

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Est. 1905

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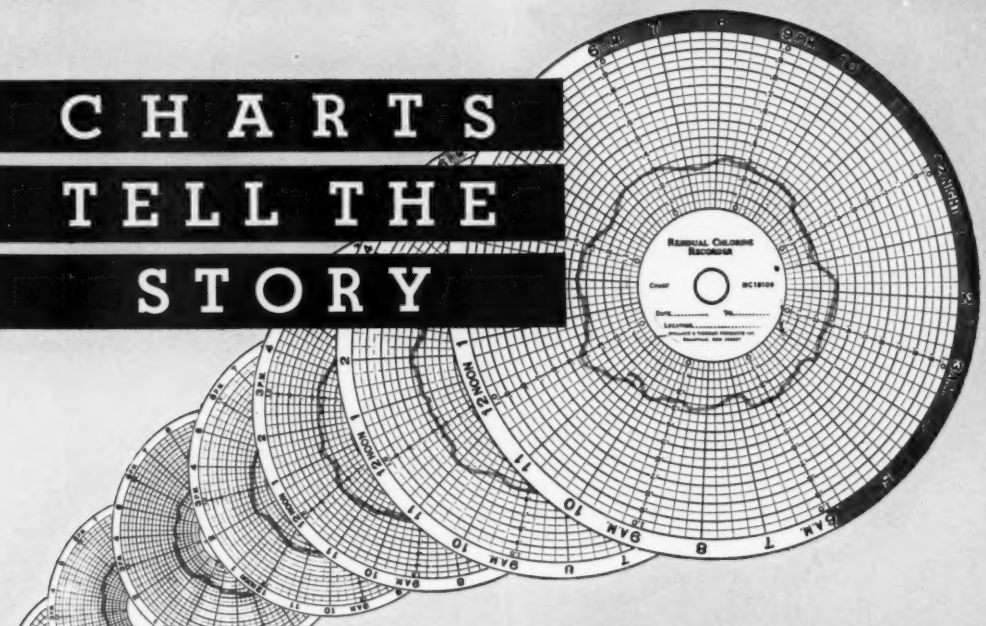
SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

CHARTS TELL THE STORY



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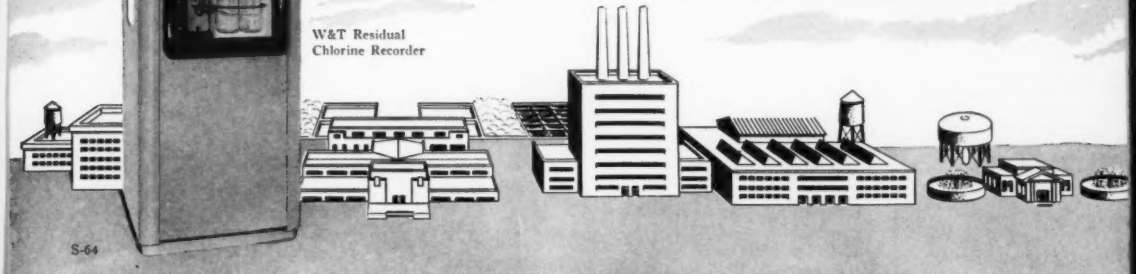

W&T Residual Chlorine Recorder

S-64